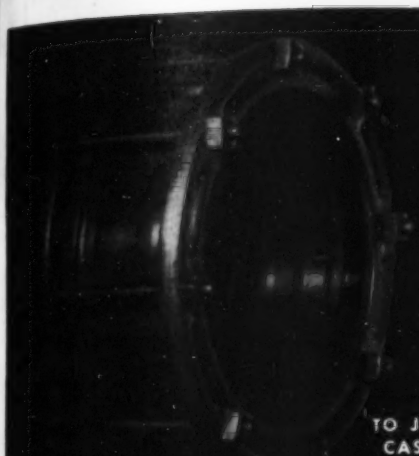


STYLE 38

TO JOIN STEEL AND CAST IRON PIPE:

COUPLINGS—Provide rugged, dependable, easily made joints at low installed cost.

TO REPAIR LEAKING BELL-AND-SPIGOT JOINTS:

BELL-JOINT CLAMPS—Most effective means for stopping or preventing leaks in cast iron bell-and-spigot joints.

STYLE 60

STYLE 90

TO JOIN SERVICE LINE PIPING:

"SUPER-SERVICE" FITTINGS—Designed for joining small diameter pipe simply, safely, permanently without threading.

YOUR PROBLEMS "create" OUR PRODUCTS

By telling us of your everyday gas line problems, you've had a big hand in helping us develop the right coupling or repair product for every need.

In turn, Dresser offers the entire gas industry the results of these solutions to specific problems . . . a complete line of economical, laborsaving products for more efficient, permanent pipe joining and repair.

TO PROVIDE INSULATING JOINTS:

INSULATING COUPLINGS—Low-cost, high-resistance joints prevent electrical current flow along pipe.

STYLE 39

STYLE 80

TO REPAIR CAST IRON MAINS:

READY-PACKED SLEEVES—Easiest, most economical way to repair breaks in cast iron mains up to 8" in diameter. Widely used as tapping sleeves.

STYLE 93

TO REPAIR LEAKS IN HIGH-PRESSURE LINES:

SPLIT REPAIR SLEEVES—Repair plain, butt, bell-and-spigot, double bell circumferential welded joints, holes or splits in steel pipe.

TO PROTECT PIPE AND JOINTS AGAINST CORROSION:

DRESSERTAPE*—Clean, easy-to use, this high dielectric plastic tape protects all underground pipe against corrosion.

*Dressertape – trade-mark of Dresser Manufacturing Division

DRESSER®

Fitting Partner for the Gas Industry

Dresser Manufacturing Division, 59 Fisher Ave., Bradford, Pa. (One of the Dresser Industries). Warehouses: 1121 Rothwell St., Houston; 101 S. Airport Blvd., S. San Francisco. Sales offices also in: New York, Philadelphia, Chicago, Toronto.

GAS

30th Year of Publication

MAY 1954 · VOLUME XXX · NUMBER 5

May 1954

$1.2 Billion Allocated for Construction by 210 Utilities 33

Facts and Figures on Natural Gas 39
By Richard J. Gonzalez

Economics of Cathodic Protection, Part 2 44
By Ray M. Wainwright

Cutting Costs in the Distribution Department, Part 2 49
By Georg Babbe

East Ohio Trains Dealers' Servicemen 54
By George Z. Griswold

Workmen's Compensation, and the Penalty for Serious and Wilful Misconduct 56
By Milford Springer

Utilities' Appliance Labs — Their Place in a Strong AGA Requirements Program 64
By Edwin L. Hall

Continuous Production of Natural Gas Substitutes by Pressure Gasification of Light Hydrocarbons 68
By E. S. Pettyjohn, H. R. Linden, and W. G. Bair

Transmission and Conditioning Section —

1954 Construction Approaches Levels of Record Years 105

A Billion Feet for Southern Natural 117
By Frank Chapman

Tandem-Type Actuator Widens Applications of Automatic and Remote Valve Control 152
By Alexander A. Toben

Editorial Comment —

Thermally Thinking, *by the Editors* 27

Technical Trends, *by Guy Corfield* 31

Pipeline Communications and Electronics, *by Frank Chapman* 164

Departments —

Current Reading 74
People 76
Calendar 80
Associations 82
News 90
New Products 90
Trade Literature 102
Pipeline News 167
Progress Reports 173
Pipeline People 176
Advertisers Index 176

IN THIS ISSUE

Opportunities for savings in pavement breaking, excavating, etc., are discussed in part 2 of an article on cutting costs in the distribution department, beginning on page 49.

A JENKINS PUBLICATION

Executive

JAY JENKINS, President and Publisher
PAUL LADY, General Manager
D. NEWLON, Advertising Manager
STANLEY K. SIWEK, Circulation Manager

Editorial

WILLIAM W. CLARK, Editorial Director
FRANK CHAPMAN, Editor
GUY CORFIELD, Technical Editor
BARBARA HALL, Managing Editor
L. D. FARRAR, Washington Editor
TRUDY SPRINGER, Editorial Assistant
RAYMOND A. GROTE, Art Director

Publication Office

198 South Alvarado St.
Los Angeles 57, California
Phone DUnkirk 7-4337

Advertising Offices

CHICAGO
WILLIAM O. DANNHAUSEN, District Manager
333 North Michigan Ave.
FRanklin 2-4615

CLEVELAND
FRANK J. ENRIGHT, District Manager
RICHARD L. De MUESY, Assistant District Manager
1836 Euclid Ave.
PRospect 1-4584

LOS ANGELES
JOSEPH R. GERYK
198 S. Alvarado St.
DUnkirk 7-4337

NEW YORK
PETER WILE, District Manager
Room 774, 11 West 42nd St.
CHickering 4-1969

TULSA
CRAIG ESPY, District Manager
2441 E. 25th Place
P.O. Box 4055
7-9807

GAS is published monthly by Jenkins Publications, Inc., 198 South Alvarado Street, Los Angeles 57, California. Subscription price: United States and possessions (in advance): 50 cents per copy; one year, $2.00; two years, $3.00. All other countries: one year, $4.00; two years, $7.00. Acceptance under Section 34.64 P. L. & R. authorized. Member: The Controlled Circulation Audit, Inc.; National Business Publications, Inc. GAS is indexed regularly by Engineering Index Inc. Publishers BUTANE-PROPANE NEWS; Handbook BUTANE-PROPANE GASES; BOTTLED GAS MANUAL; Annual BUTANE-PROPANE Catalog; WESTERN METALS. The name "GAS" is registered, U. S. Patent Office.

Thermally Thinking

SPOT NEWS AND COMMENT ON GAS INDUSTRY AFFAIRS

Highlighting the News

Natural gas goes into Congressional hearings

Hearings were to start in the Senate May 6 on the Ferguson bill to amend the Natural Gas Act to specifically allow only original cost less depreciation for gas produced by natural gas companies. The Hunt bill providing that FPC approval of any application to import or export natural gas would be restricted if the commission found that such movement of the gas would result in "economic dislocation, unemployment or injury to competing fuel industries" will be heard May 13. Both bills will come before the Business and Consumers Interest subcommittee of the Interstate and Foreign Commerce Committee.

Automatic ignition may be approval requirement

The Gas Industry Development Committee has set Jan. 1, 1956 as a target date for incorporation of automatic ignition of all gas range burners in approval requirements, Theodore Wolfe of Baltimore revealed at the recent Eastern Natural Gas Regional Sales Conference in Pittsburgh.

TIPRO moves to block underground storage bill

Unsuccessful in its attempts to torpedo the Hinshaw bill (clearing intrastate transmission companies from federal jurisdiction), which is now law, the Texas Independent Producers & Royalty Owners Association is petitioning Texas representatives in Congress to "withhold" action on bills such as S. 525 which would give pipeline companies eminent domain for underground storage, "pending a study." TIPRO's study, to determine the "degree to which (storage) projects result from artificially depressed wellhead prices in Texas," will be the subject of a report to be ready for submission to the appropriate Congressional committee early in 1955.

"There is reason," says President Jack Woodward, "to inquire as to the extent such projects are made economically feasible only because a combination of forces have prevented wellhead gas prices in Texas from reaching normal competitive levels."

Ohio clears decks for unlimited gas househeating

Practically all restrictions are off in the state's gas househeating market, Ohio's PUC has announced. Only the towns of Newark and Defiance are being kept under the ban—pending further efforts to increase supplies. Columbia Gas System and Consolidated Gas, the two major suppliers for the state, had asked for the thawing of the seven-year freeze several weeks ago. PUC will retain a measure of control through a quarterly system which will keep the commission informed of supply and demand.

Minuscule improvement seen in water heater shipments

GAMA reports for March showed a 14,000 gain over February's movements of automatic gas water heaters, but in the year-to-year comparison March's 188,900 figure was 14,000 short of March 1953. The net change was a decrease of 6.9%, slightly better than February's 7.2% decrease from February of 1953, and January's 10.7% decrease. The first quarter's loss was 8.2%, with 528,000 units shipped as against 575,500 last year.

FPC finally recognizes fair field value

While Panhandle Eastern Pipe Line Co. failed to get all the rate increase it asked for, it did receive FPC recognition of the fair field value of the gas it produces (see "An Eye on the Capital"). The placing of a value of 8.4398 cents on the gas meant the abandonment of a "cost" figure estimated by the commission at .85 cents and by Panhandle at *minus* 1.24 cents. Yet the increase to the residential customer at the far end of the line is only 1.6%, the commission figures.

It's refrigerator season

On May 1, AGA and Servel began pushing the four-month "On Our Way" gas refrigerator sales campaign. Along with an attractive package program, a special contest with cash prizes is being started, with all gas companies—nonmerchandising as well as merchandising—eligible. Companies, sales managers, and salesmen may win awards.

ConEd fires opening gun in "biggest" heating campaign

A promotion that will run for seven months in Con Edison's New York territory began on April 21, with the object of selling gas for househeating, water heating, apartment house incineration, and clothes drying. "Gas Heat's Best—Costs Less Than You Think" is the theme of the four-way campaign (TV, radio, newspaper, and direct mail). More than 1500 newspaper insertions are scheduled. ConEd will create demand, dealers will cash in on it.

An Eye on the Capital

FPC sets precedent in historical Panhandle case

The Federal Power Commission has issued an opinion and order prescribing wholesale natural gas rates for Panhandle Eastern Pipe Line Co., Kansas City, Mo., which—based on the test year 1952—reduce the amount of an increase proposed by the company from $21.4 million per year to $12,778,864 annually. The new rates will be effective as of May 1, 1954.

The commission's action is expected to result in refunds totaling at least $32 million to Panhandle's 48 utility cus-

tomers in Kansas, Indiana, Mississippi, Ohio, Illinois, and Michigan. The company's proposed $21.4 million increase has been in effect under bond, subject to refund, since Feb. 20, 1952.

The FPC said, however, that it would not determine the disposition of the refund amounts until it had a chance to study the actual operating results throughout the entire refund period, to determine the difference between them and the estimates used in the computations.

In its opinion accompanying the rate order, the commission devoted considerable attention to what it termed its "transition" to a more realistic approach to the pricing of pipeline-produced gas than it has taken in the past. The commission indicated that the new approach would result in regulatory policies designed to encourage, rather than penalize, natural gas exploration, development, and production by the pipeline systems themselves.

The FPC rejected the traditional "rate-base" approach recommended by its staff, and instead ruled that the public interest would better be served by permitting Panhandle to receive for the gas it produces a price reflecting the weighted average arm's-length payments for identical natural gas in the fields where it is produced. This method allows Panhandle an average price of 8.4398 cents per thousand cubic feet for its own produced gas.

Under the method advocated by the staff, the company's own gas reserves, the equipment used in producing it, and operating expenses chargeable thereto, would be included in the rate base—along with facilities used in transporting and selling the gas to customers—at the investment which they represent.

The commission declared that the staff's position gives but "scant attention to the economic aspects of the question or to the long-run economic consequences of the course which it advocates." Rather, the FPC continued, it seems to stand primarily on the fact that this has been the commission's long-established policy which has been sanctioned by the courts, including the United States Supreme Court.

However, after reviewing various Supreme Court statements, the FPC concluded that it is clear that the commission is free, as a matter of law, "to deal with this economic matter in accordance with its experience and best judgment as to what constitutes sound public policy."

The staff said that its "cost" approach would result in valuing Panhandle's own-produced gas at a maximum of .85 cents per thousand cubic feet. Panhandle, however, claimed that the rate-base approach would produce a minus valuation of 1.24 cents per thousand cubic feet on such gas. Accepting this view, the FPC also noted that in certain instances Panhandle's partners in particular wells earn after all expenses and taxes from 5 to 5.6 cents, receiving a price of 8 to 9.8 cents, while lessors and royalty owners are paid for gas produced from the same well at a rate of 9 cents per thousand cubic feet.

The commission said that it saw no sound reason why it "should arbitrarily treat the natural gas of some producers according to a completely different method from that used in the case of natural gas produced by others." Apart from the economic incongruity of such a price situation, the commission said, "there is the fundamental and paramount question, whether such result would be in the public interest, and whether it would even be in the ultimate interest of the consumers who have come to rely increasingly upon natural gas as a major source of their expanding energy requirements. Obviously, an arbitrarily depressed price, related to what may truly turn out to be a 'vanishing rate-base,' would tend to both accelerate the consumption and fail to encourage the discovery and development of this limited and irreplaceable natural resource." The FPC declared that the interest of the public "definitely lies in the direction of natural-gas production by pipeline systems themselves, as distinguished from their complete dependence for gas supply upon purchases from other producers."

By making necessary adjustments to permit a valid comparison between the results of the two pricing approaches, the commission showed that the method proposed by Panhandle yields an overall result which is 1.3 cents per thousand cubic feet higher than a rate based on the "cost" of its own produced gas as computed by the staff. Projecting this differential to residential customers in Detroit—at the extreme end of Panhandle's system—the difference in monthly cost to the typical home, using an average of 18.7 thousand cubic feet, would be only 24.33 cents, or 1.6% of the gas bill, the FPC said. The gas which Panhandle produces itself comprises less than one-fourth of its total gas supply.

The commission denied motions of Michigan Consolidated Gas Co. (supported by the city of Detroit and the county of Wayne, Mich.), and the International Union of United Auto and Aircraft Implement Workers of America, to reopen the record for the taking of what was described as newly discovered evidence on the volume of sales of Panhandle that should be used in determining the cost of service.

In other rulings, the FPC rejected contentions that only the amount of taxes actually paid by Panhandle should be allowed in the cost of service and that the temporary tax savings accruing to the company by virtue of accelerated amortization, provided for by Congress and other federal agencies, should be passed on to customers.

Commissioner Draper dissented and Commissioner Doty dissented with respect to the treatment of federal income taxes as affected by accelerated amortization.

Hinshaw Act will be political football

The Hinshaw Bill, now is the law of the land, but many of the Democrats who voted against the legislation are glad to have it as an issue this fall, and some of the far-seeing ones say that it will be an issue from now on, or as long as gas companies must petition for increases to maintain fair profits. Every time rates go up for consumers in a new northern area, the politicians can say: "I told you so . . ." It may be a real weapon, sooner or later.

Gas companies were grateful to President Dwight D. Eisenhower for his statement when he signed the Hinshaw Act, Public Law No. 323, which gives the state public utility commissions jurisdiction over intrastate gas distributing utilities purchasing out-of-

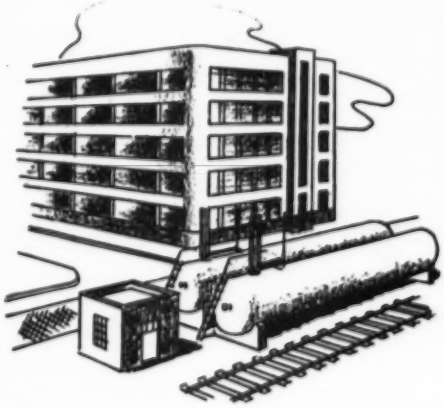
Continued on page 75

GAS

Philgas*

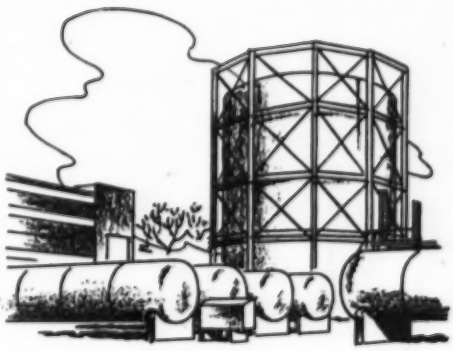
THE ALL-PURPOSE FUEL

For Industries



Philgas, a clean, high-quality LP-Gas, is being used by leading industries for heat treating, mold drying, core baking, ceramic firing and many other operations. Philgas butane-propane systems are automatic, cutting down on overhead while assuring constant furnace temperatures, atmospheres, and pressures.

For Utilities



Free from harmful contaminants, Philgas is used by many progressive utilities to augment supplies of natural or manufactured gas. Cleanliness, uniformity, constant pressures (high or low) and easy automatic operation make Philgas a *superior* product. It's America's largest selling brand of LP-Gas.

*Phillips *66* and Philgas are the Phillips Petroleum Company trademarks for its high quality propane-butane LP-Gas or bottled gas.

PHILLIPS PETROLEUM COMPANY

Sales Department **Bartlesville, Oklahoma**

Offices located in Amarillo, Tex., Atlanta, Ga., Chicago Ill., Denver, Colo., Des Moines, Ia., Indianapolis, Ind., Kansas City, Mo., Minneapolis, Minn., New York, N. Y., Omaha, Nebr., Raleigh, N. C., St. Louis, Mo., Tampa, Fla., Tulsa, Okla., Wichita, Kan.

How good a buy is a bargain?

Valves are no exception in "bargains" offered every day. Maybe you could afford to buy such valves—if you didn't look beyond the price tag . . . didn't care about quality . . . didn't figure their real cost.

But you're aware of current maintenance labor rates. You know the labor part of piping installations has grown bigger and bigger . . . that valve repairs aren't the small jobs they used to be. So you want greater assurance of dependability—not fictitious savings in price.

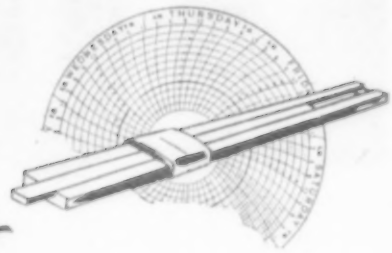
Buying with an eye to real value marks today's thrifty buyer. That's why he prefers traditionally dependable Crane quality. He knows it means longer life, greater freedom from trouble . . . and that Crane puts such quality into piping equipment for every need.

Crane Co., *General Offices:* 836 S. Michigan Ave., Chicago 5, Ill.
Branches and Wholesalers Serving All Industrial Areas.

CRANE

VALVES • FITTINGS • PIPE • PLUMBING • HEATING

Technical Trends



• By GUY CORFIELD

Solar energy — heat pump systems

The heat pump principle, also referred to as reverse refrigeration, has been studied and put to limited use for space heating for many years. Essentially it consists of a mechanism whereby heat at a low level, such as at the temperature of winter outside air, or ground water, can be concentrated and released at a higher level sufficient to warm and maintain a house at comfort temperature.

This is similar to what takes place in a household refrigerator where heat is removed from the food or freezing compartment and released from the coils and fins at the back of the refrigerator. If a gas or mechanical refrigerator were installed in an outside wall of a room, with its front outward with door off, and its back inward, it would warm the room with heat abstracted from the outside air. This heat would not, of course, be free, as it would be made available only by supplying gas or electric energy to the refrigerator operating mechanism. In temperate climates where the outside air is not very cold, or where the low level heat can be obtained from water, and the "pumping" required is therefore relatively moderate, the costs of house heating in this manner may approach conventional heating methods.

Application of the heat pump for house heating has also been considered in connection with heat obtained from solar energy. In this scheme use is made of a "collector" which is a heat-absorbing assembly of large surface, which may take the form of a wall or other south-facing external portion of the house, and will absorb and store heat from the sun during the daylight hours —storage being in heat-of-fusion type chemicals or other suitable materials that have a large capacity for heat without undergoing great temperature change.

The collector conventionally consists of glass front surface behind which is metal sheet painted dull black, the metal sheet in turn being backed up by a narrow insulated air space which receives the solar heat through the glass and the metal. A fan circulates the heated air from this space across and around containers of the heat-storing chemical.

A typical chemical is commercial anhydrous sodium sulfate mixed with the required amount of the water to cause the heat storing-liberating transformation from liquid to crystals to occur at an appropriate temperature. The containers (metal drums of convenient size for handling, permanently sealed so that there are no leaks, gases or odors) are placed in an insulated enclosure that can reasonably conform to the house plan and construction. The heat pump can then abstract this stored heat during the non-daylight hours.

Rather obviously, such heating systems would not be practical in areas where the percentage of sunlit days in winter is low, but might be effective in relatively cold areas where there is considerable winter sunshine. It is the conclusion of R. C. Jordan and J. L. Threlkeld of the University of Minnesota Department of Mechanical Engineering, from research sponsored by the American Society of Heating and Ventilating Engineers, that

> "In many localities solar energy heat pump systems would result in lower heating costs at the present time than conventional fuel-fired systems. . . . At present, such systems would have a high first cost because of the need for custom building of the solar energy system. However, with standardization of collectors and heat storage units, it would be possible to reduce these costs. . . . No serious architectural problems appear to exist since a house may be designed to include a moderately large south-facing collector and yet retain architectural appeal and livable qualities equal to those of conventional homes. Solar energy heat pump systems appear feasible in a large part of the United States but further research and development is necessary before such systems may be adopted on a large scale."

Corrosion of nickel cast iron in soils

An item of the above title, in the National Bureau of Standards Journal of Research of December 1953, describes the examination of cast iron specimens containing various amounts of nickel that were buried in 15 different soils for an 11-year period. Seven different cast irons were involved, one being plain iron with no nickel, five being low alloy iron with nickel varying from 1.27 to 3.32% and with copper from 0.32 to 1.10%, and the seventh being high alloy with 15.0% nickel, 6.58% copper, and 2.61% chromium.

Based on either maximum pit depth, or loss of weight (when corrosion products were removed), the high alloy specimens showed good resistance in most of the soils; the low alloy irons, however, did not in general exhibit better resistance than the plain iron and were badly pitted and corroded at the end of the burial period. This seems to again verify the opinion, held by most corrosion engineers, that small percentages of alloying metals have very little if any effectiveness in improving the underground corrosion resistance of iron or steel.

MUELLER

No. 4 LINE STOPPER UNIT

PATENTED

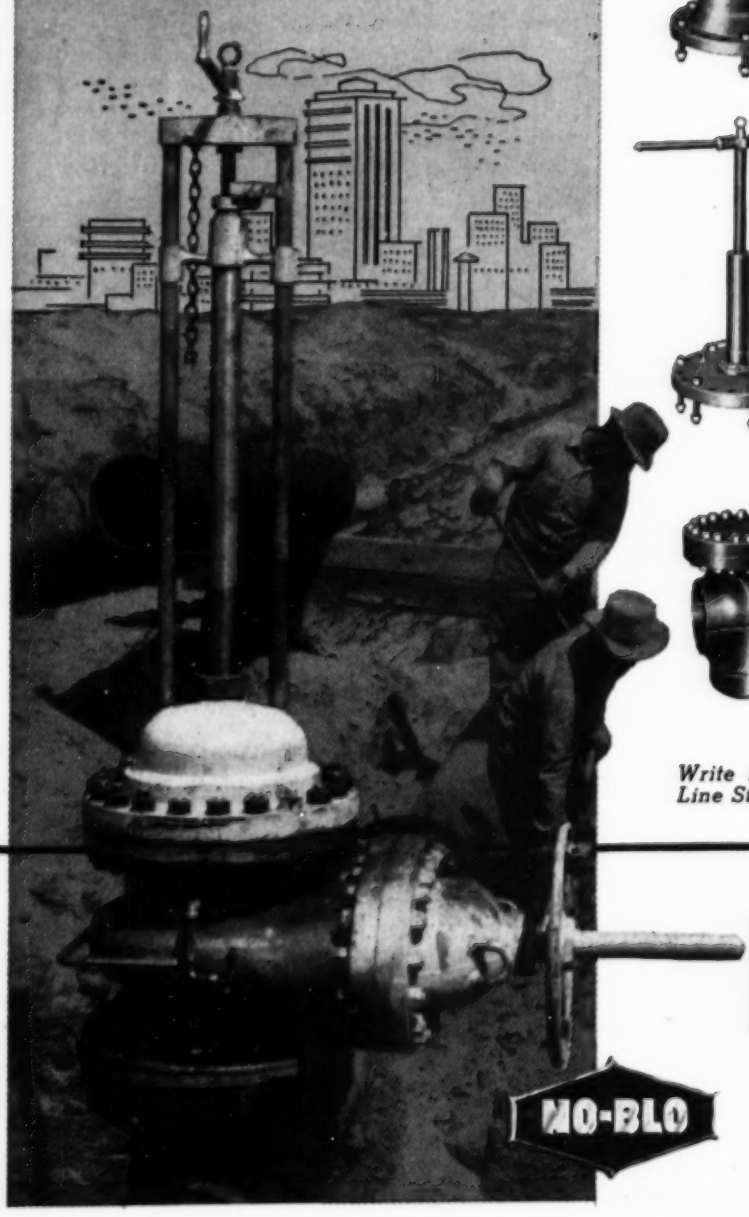
Stop off 10" and 12" steel lines safely, under pressure, with the Mueller No. 4 Line Stopper Unit. Equipped with series 40 flanges, the No. 4 Unit is designed for working pressures of 500 psi and temperatures up to 250° Fahrenheit with an adequate factor of Safety.

• The H-17440 Line Stopping Machine, with steel wedge stopper and special rising stem steel gate valve.

• The H-17445 balanced pressure Completion Machine.

• The H-17257 Line Stopper Fitting, sizes 10" and 12", complete with "O" ring type, balanced-pressure completion plug. Spring-loaded ball check valve in completion plug, activated by the inserting or extracting tools, assures equal pressure on both sides, allowing easy insertion and extraction of the completion plug.

Write for complete information on the No. 4 Line Stopper Unit.



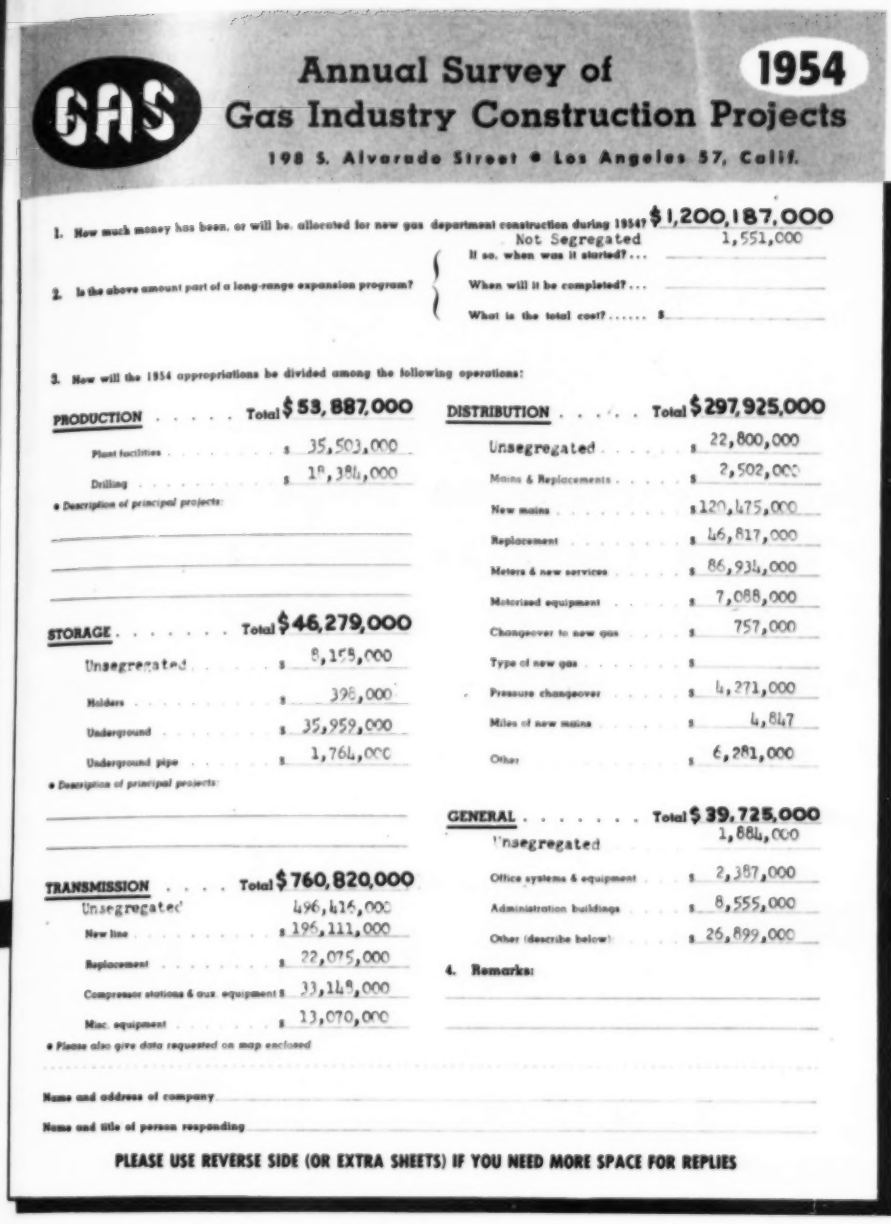
MUELLER CO.

Dependable Since 1857

MAIN OFFICE & FACTORY DECATUR, ILLINOIS

GAS survey

$1.2 billion allocated for construction by 210 utilities



GAS

Annual Survey of Gas Industry Construction Projects 1954

198 S. Alvarado Street • Los Angeles 57, Calif.

1. How much money has been, or will be, allocated for new gas department construction during 1954? $1,200,187,000
   Not Segregated 1,551,000
2. Is the above amount part of a long-range expansion program?
   If so, when was it started? ...
   When will it be completed? ...
   What is the total cost? ..... $
3. How will the 1954 appropriations be divided among the following operations:

PRODUCTION . . . . . Total $53,887,000

Plant facilities	$ 35,503,000
Drilling	$ 18,384,000

• Description of principal projects:

STORAGE . . . . . Total $46,279,000

Unsegregated	$ 8,158,000
Holders	$ 398,000
Underground	$ 35,959,000
Underground pipe	$ 1,764,000

• Description of principal projects:

TRANSMISSION . . . . Total $760,820,000

Unsegregated	496,416,000
New line	$ 196,111,000
Replacement	$ 22,075,000
Compressor stations & aux. equipment	$ 33,148,000
Misc. equipment	$ 13,070,000

• Please also give data requested on map enclosed

DISTRIBUTION . . . . . Total $297,925,000

Unsegregated	$ 22,800,000
Mains & Replacements	$ 2,502,000
New mains	$ 120,475,000
Replacement	$ 46,817,000
Meters & new services	$ 86,934,000
Motorized equipment	$ 7,088,000
Changeover to new gas	$ 757,000
Type of new gas	$
Pressure changeover	$ 4,271,000
Miles of new mains	$ 4,847
Other	$ 6,281,000

GENERAL . . . . . Total $39,725,000

Unsegregated	1,884,000
Office systems & equipment	$ 2,387,000
Administration buildings	$ 8,555,000
Other (describe below)	$ 26,899,000

4. Remarks:

Name and address of company

Name and title of person responding

PLEASE USE REVERSE SIDE (OR EXTRA SHEETS) IF YOU NEED MORE SPACE FOR REPLIES

The lion's share of the 1954 outlay will be spent on transmission projects—$760 million, as shown in the total at left. Second largest item is distribution, with nearly $300 million.

Four pages of tables giving a breakdown of expenditures by categories follow, beginning on Page 34. An itemized analysis of individual projects planned by pipeline companies, with detailed maps, appears in the Pipeline Section, beginning on Page 105.

INTO the relentless campaign of natural gas to move from third to first place as America's leading source of energy, some 210 major gas utilities and transmission companies plan to pour $1.2 billion during 1954. Extrapolated to cover the entire field, this volume gives a sound indication of the gas industry's determination to fulfill its promise to overtake the faltering coal interests' No. 2 spot within five years and begin going after the present energy leader, oil.

The impressive figure, compiled in the latest annual *GAS* survey of budgets for the current year, also substantiates the statement that "There is no recession in the gas industry."

The amazing growth through the postwar period, which has seen natural gas production double in seven years, has set a pattern which it is evident will be followed in the years to come. As Richard J. Gonzalez, distinguished economist with Humble Oil & Refining Co., Houston, said* before the recent American Power Conference in Chicago:

"If the postwar trend continues, natural gas may surpass coal within five years and in time even challenge oil for supremacy as our leading source of energy."

The 1954 *GAS* survey gives strong indications that the trend *will* continue. The only question is, for how long and at what level?

All the signposts point to a route that will be roughly parallel to that of the L. P. gas industry, where a mushrooming growth pattern has steadied off into a sound, strong curve upward. There will be no repetition of the automobile industry's recent and sudden "recession," because there are too many factors present to prevent it.

The "boomish" look is going, but in its place will come a healthy prosperity; the heyday of the promoter may be on the wane, but the star of the operating man is in its ascendancy. Initial lines have reached out to serve most major markets, but an aggressive mar-

Continued on page 38

*An excerpted version of Mr. Gonzalez' talk appears elsewhere in this issue.

1954 building budgets of 210 gas companies: $1.2 billion

(in thousand of dollars)	PROD.			STORAGE			TRANSMISSION				DISTRIBUTION								GENERAL		
	Total	Plant	Drilling	Holder	Underground	Pipe	New Line	Repl.	Comp. Sta.	Misc.	Mains	Miles of Main	Repl.	Meters	Motor Equip.	Gas Change	Press. Change	Other	Office	Bldg.	Other
Alabama Gas Corp., Birmingham	4000	90									2298	220	180	1000	197				75	35	
Alabama-Tennessee Nat. Gas Co.	230						180	20		30											
Arizona Public Service, Phoenix	2113										937	75	169	925			39				43
Ark. Louisiana Gas Co., Shreveport	9245						←——9245——→														
Arkansas-Missouri Power, Blytheville, Ark.	191										75	10		107							9
Ark.-Western Gas Co., Fayetteville	1100	100	200				70			80	400		16	159	25						50
Atlanta Gas Light Co., Ga.	6010	267									2349	295	44	2129	200	278		642	43	58	
Atlantic Seaboard Corp., W. Va.	14,035						12,191	218	1535	55											36
Battle Creek Gas Co., Mich.	139	4									61	6	8	66							
Bridgeport Gas Light Co., Conn.	641	10		10			166				186	6		236	15		8		10		
Brooklyn Borough Gas Co., N. Y.	260	20									88	3		82			21		19	8	22
Brooklyn Union Gas Co., N. Y.	2580	200									400	12	55	1070	175						680
Binghamton Gas Works, Penna.	770	18									←——707——→								←—45—→		
Bluefield Gas Co., Bluefield, W. V.	30										20	5	5	5							
Corning Nat. Gas Corp., Corning, N. Y.	870						668	14		1	77	7	62	33	6				1		8
Consumers Power Co., Jackson, Mich.	10,200										3902		5143	1155							
City of Springfield, Mo.	691										425	17		255	11						
Cons. Gas, Elect. Light & Power Co., Md.	6700	500										90	←——6200——→								
Cities Service Gas Co., Oklahoma City, Okla.	8756	1430	174		1723		1152	2853	896	138									22		368
Central West Util. Co., Kansas City, Mo.	240						65	29			70	10	47	17	8		1		2		1
California-Pacific Utilities Co., Calif.	371	18									242		27	70	2	10			2		
Central Illinois Light Co., Peoria, Ill.	1590	355									822	12	273	140							
City of Hastings, Nebraska	80										20	4	40	20							
Cheyenne Light, Fuel & Power Co., Wyo.	171										72		7	78	14						
City of Richmond, Va.	983	350									400	25	10	220	3						
Canadian Western Nat. Gas Co., Calgary	2071						36	175		115	550	42	300	440	144		10		13	275	13
Citizens Gas & Coke, Indianapolis, Ind.	5162	903			820						1571	75		715	153			306	69	625	
Conn. Gas Co., Conn. Light & Power	982	261						150		15	237		64	255							
Central Hudson Gas & Elec. Co., N. Y.	520	10						15	115	20	100		95	150	15						
Central Kentucky Nat. Gas Co., W. Va.	1686						1552	62													72
Coast Counties Gas & Elec. Co., Calif.	1729										776	65	193	726	26						8
Citizens Gas & Fuel Co., Adrian, Mich.	104	15									13	1	16	23	4				7	19	7
Company B	65										35		15	15							
Consolidated Edison Co. of New York	7400	700		←800——→							←——5000——→										900
Cumberland & Alleghany Gas, Penna.	1583	521					←——229——→				←——694——→								←—139—→		
Colorado Interstate Gas Co.	25,600						←——25,600——→														
Central Illinois Pub. Service Co., Springfield	671						155	40	2	18	216	8	146	80	14						
Chattanooga Gas Co., Tenn.	600	60									350	25	25	150	15						
Cincinnati Gas & Electric Co.	3096	38					206	376			701	40	685	362	87		632		2	7	
Company C	1472										623		207	438	111		28		50	15	
City of Norwich Dept. of Pub. Util., Conn.	77	3		25					1		5	1		22	4				3	5	9
Consolidated Gas Util. Corp., Okla. City, Okla.	1471	35			31		315	490	7	59	99	19	167	156					23		89
City of Alexandria, Louisiana	50										50										
Colorado Western Pipeline (pending)	54,600						←——54,600——→														
Company D	108,000	5700	4800		21,700		33,700	9100	5700	5800	10,000	3000	5000					700			2800
Delaware Power & Light, Wilmington	1350	163					9		175	6	126		258	211	25	360		17			

Company D	108,000	5700	4800		21,700		33,700	9100	5700	5800	10,000	3000	5000				700				2800		
Delaware Power & Light, Wilmington	1350	163					9		175	6	126		258	211	25	360		17					
Dayton Power & Light, Dayton, Ohio	2466										1722	89	289	415	40								
East Tenn. Nat. Gas Co., Knoxville	400						←——400——→																
Empire Southern Gas Co., Texas	146	1					40	1			40	18	2	38	3				2		19		
East Ohio Gas Co., Cleveland	17,428	136			199	132	8438	532	18	65	3500	222	2755	1200					63		390		
Eastern Kansas Gas Co., Iola	5						5																
El Paso Natural Gas	175,250						←——175,250——→																
(Pending)	4094						←——4094——→																
Fitchburg Gas & Elec. Light, Mass.	98	5									56	2		36							1		
Florida Power & Light, Miami	481	150									138		40	121							32		
Gas Service Co., Kansas City, Mo.	4163										2050	220	200	1450	238				70		155		
Great Falls Gas Co., Mont.	135	No Breakdown																					
Gulf Interstate Gas Co., Houston, Texas	40,000						33,500		6500														
Gas Service Inc., Nashua, N. H.	31										5		25							1			
Greenwich Gas Co., Greenwich, Conn.	85										38	3	10	21	8			8					
Holyoke Gas & Electric, Mass.	500	150			125						75	4		50	10					90			
Houston Pipe Line Co., Houston	2057						1085			250	370		200	57						95			
Home Gas Co., Pittsburgh, Penna.	2979			←734——→			←——2207——→												←——38——→				
Hartford Gas Co., Hartford, Conn.	476	16									140	7	10	233	57		16		4				
Hoosier Gas Corp., Vincennes, Ind.	230				90	35	27				15	3	15	40	5				3				
Haverhill Gas Light Co., Haverhill, Mass.	273	89					65				90		15		11				3				
Housatonic Pub. Serv. Co., Derby, Conn.	559	58									221	2	102	27	82	9			4	46	10		
Interstate Power Co., Dubuque, Iowa	203										134		57	12									
Indiana Gas & Water Co. Inc., Indianapolis	1571	9			60	47	310	59	5	30	458	35	107	419	47				4		16		
Iowa-Illinois Gas & Elec. Co., Davenport, Iowa	2830										1305		190	876	53		229	177					
Iowa Power & Light, Des Moines, Iowa	2100										1639	125	40	358	16		32		15				
Iowa Public Service, Sioux City, Iowa	805	45									320		12	393	30				6				
Knoxville Utilities Board, Knoxville, Iowa	150	70									35			30							15		
Kentucky-West Virginia Gas Co., Ashland, Ky.	2492	586	1818					2	11	1									2	1	71		
Kans.-Nebr. Nat. Gas Co. Inc., Hastings, Nebr.	8727	1983	1216				2699	524	815	163	698		63	212	32				30	150	142		
Kings County Light Co., Brooklyn, N. Y.	375	75					5	20						180	50				10	35			
Kansas Pub. Serv. Co. Inc., Lawrence, Kan.	65										15		25	25									
Keystone Gas Co., Pittsburgh, Penna.	384	2									←——360——→								←——22——→				
Louisville (Ky.) Gas & Electric Co.	1499	5			232			94	13		725		50	380									
Louisiana Power & Light Co., New Orleans	1050										484	70	45	419	70						32		
Lone Star Gas Co., Dallas, Texas	20,000	3591	3852				1907	865	244	83	2644		2741	2008	441				175	580	869		
Lynn Gas & Electric Co., Lynn, Mass.	365										300	4	21	30	8								
Lake Shore Pipe Line Co., Ashtabula, Ohio	44													4	3	6			1		36		
Lake Shore Gas Co.	378										208		30	92	21				8	2	17		
Minneapolis Gas Co., Minneapolis, Minn.	5705	110		1							2502	73		2165					53	175	699		
Milwaukee Gas Light Co., Milwaukee, Wisc.	5700										1750	71	230	1000	140		360	520			1900		
Michigan Gas Storage Co., Jackson, Mich.	171				90				35										46				
Mid South Gas Co., Little Rock, Ark.	470										147	24	31	166	16		11				99		

	PROD.			STORAGE			TRANSMISSION				DISTRIBUTION								GENERAL		
	Total	Plant	Drilling	Holder	Underground	Pipe	New Line	Repl.	Comp. Sta.	Misc.	Mains	Miles of Main	Repl.	Meters	Motor Equip.	Gas Change	Press. Change	Other	Office	Bldg.	Other
Missouri Utilities Co., Cape Girardeau, Mo.	279						50				126	20	25	75							3
Madison Gas & Electric Co., Madison, Wisc.	428										70	3	283	64					8		3
Metro Utilities Dist., Omaha, Nebr.	1955										1032	32		696	30				45	23	129
Memphis Light, Gas & Water, Memphis, Tenn.	3650					1550					679	60	35	686	100				50	400	150
Montana Dakota Utilities Co.	4797	223	88		349		1405	469	793	213	388		344	406					12	5	102
Manufacturers Light & Heat, Pittsburgh, Pa.	27,295	449		←-	5520	-→	←-	14,529		-→	←			5875				-→	←	922	-→
Mountain Fuel Supply, Salt Lake City, Utah	5757	247	1950					178		53	1540	100		1186	88			85	55	375	
Municipal Gas Dept., Long Beach, Calif.	1808								358		675	25	500	225					35		15
Manchester Gas Co., New Hampshire	87	3									30	1	9	35	9				1		
Missouri Natural Gas Co., Farmington, Mo.	366										166	14	50	100	10				5		35
Minnesota Nat. Gas Co., Worthington, Minn.	300										195	30		100	5						
Michigan Consolidated Gas, Detroit	10,800	200		←	260	-→	←	100		-→	5300		1260	1750	540		620		130	400	240
Mississippi Valley Gas Co., Jackson	1889	1			63		65	6		1	918		130	610	30				20	24	21
Missouri Public Service, Warrensburg	676						←	676		-→											
Northern Natural Gas Co., Omaha	53,500	1789	900				36,654		7951	2831	802	102	10	327	105				122	45	1964
Northwestern Utilities Ltd., Edmonton, Canada	3734	310					1535	18	15	69	706	68	59	590				22	24	200	186
North Dakota Natural Gas Trans. (pending)	10,800						←	10,800		-→											
New Haven Gas Co., New Haven, Conn.	500	86									193	8	88	93	35				5		
Natural Gas Co. of W. Va., Pittsburgh, Penna.	1359	172		←	14	-→	←	618		-→	←			485				-→	←	70	-→
Niagara Mohawk Power Corp.	10,251	220					370	693	730		4836	213	1962	1240	200						
Northern States Power Co., Minneapolis, Minn.	4054	10									2728	85	245	871	200						
Newport Gas Light Co., Newport, R. I.	102	8									10			16	10						58
Nashville Gas Co., Nashville, Tenn.	848										495	40	10	300	25				8		10
Natural Gas Pipeline Co.	650						125		500	25											
Northwestern Public Service, Huron, S. D.	432	18		13							191		95	60	27					10	18
New Bedford Gas & Edison Light, Mass.	378	25		24							190	3		100	24				5		10
New Britain Gas Light Co.	185	19									64	3		66	6				15		15
North Shore Gas Co., Waukegan, Ill.	1564	2					500				346	12	194	400				43	7		72
Northern Indiana Fuel & Light, Auburn, Ind.	877						←	877		-→											
Northern Indiana Pub. Serv., Hammond, Ind.	7291										534	80	2745	1995	240				25	467	1285
Company "A"	1247										347		6	806	13						75
New York State Electric & Gas, Ithaca, N. Y.	3478	54					336	336	16	7	1191	30	800	735					3		
Northwest Alabama Gas Dist., Hamilton, Ala.	4000						←	4000		-→											
Northwest Natural Gas Co., New York	36,000						←	36,000		-→											
Ohio Gas Co., Bryan, Ohio	199										35	2	67	52	6				4	9	26
Oklahoma Natural Gas Co.	10,653	89	1859		887		365	916	56	305	808		1013	415				634	192	60	828
Pacific Gas & Elec. Co., San Francisco, Calif.	22,330	50					800	450	100		2250	114	4240	9070	980						4390
Peoples Gas Light & Coke Co.	14,060			123			2420			204	2820	34	306	4320	642			960	188	1477	600
Peoples Natural Gas Co., Pittsburgh, Penna.	5295	294	469		85		632	376	224	125	1532	40	605	465	175			37	15		761
Peoples Water & Gas Co., No. Miami, Fla.	475	116									162	10	30	115	20				28	3	1
Petersburg & Hopewell Gas Co., Petersburg, Fla	250										158	12	15	68	4				5		
Portland Gas Light Co., Portland, Maine	103										80	4	10	7					6		
Portsmouth Gas Co., Portsmouth, Va.	171	11									63	17		57	19			7	8		6
Providence Gas Co., Providence, R. I.	800	200									400		200								
Pineville Gas Co. Inc., Monroe, La.	110										47		31	22					8		2
Philadelphia Electric Co., Philadelphia, Penna.	7349	650					485		900	455	2249	138		584				1212	166	648	

Portsmouth Gas Co., Portsmouth, Va.	171	11									63	17		57	19				7	8		6		
Providence Gas Co., Providence, R. I.	800	200									400		200											
Pineville Gas Co. Inc., Monroe, La.	110																							
Philadelphia Electric Co., Philadelphia, Penna.	7349	650				485		900	455	47 2249	138	31	22 584			1212	166	8 ←—648—→		2				
Portland Gas & Coke Co., Oregon	800	176								591								13		20				
Pittsfield Coal Gas Co., Pittsfield, Mass.	174			29						60		18	41	13			11	2						
Public Service of Colorado & Subsidiaries	4630					359	42	27	21	1307	205	630	2192	27				25						
Public Service Elec. & Gas, Newark, N. J.	33,000	9600								17,000	240	1000	4000	60			640	40		600				
Public Service of N. C. Inc., Gastonia, N. C.	2500					2500																		
Roanoke Gas Co., Roanoke, Va.	157									110	5		35	4		3		5						
Rio Grande Valley Gas Co., Brownsville, Texas	431					6	10			150		145	70	30				20						
Rockland Light & Power, Spring Valley, N. Y.	844	66								495	22	38	220							25				
Rochester Gas & Electric Corp.	4223	363								1941	45	674	1125	15		50				55				
Shenandoah Gas Co., Lynchburg, Va.	1466					←———1466———				→														
Southern California Gas Co., Los Angeles	30,446			13	2400	764	1205	2461		3706	358	5613	9997			828		189	2169	1101				
South Carolina Elec. & Gas Co., Columbia, S. C.	763	32								549			173							9				
Seattle Gas Co., Seattle, Wash.	382	78								97	3	54	90	33	25			5						
Southwestern Mich. Gas Co., Port Huron, Mich.	200									50		50	70	10				5		15				
South Carolina Natural Gas Co.	400					400																		
Sierra Pacific Power Co.	279	45		27						58	4	53	85	9						2				
South Jersey Gas Co., Atlantic City, N. J.	867	56							6	245	30	136	322	54				23	25					
San Diego Gas & Electric Co., San Diego, Calif.	3725	6			36			72		984	90	950	768	97			43	51	519	126				
Southwestern Public Service, Amarillo, Texas	168									93	4	7	64							4				
Southern Indiana Gas & Elec., Evansville, Ind.	1175	3			250	269				271	9	190	169					3	8	12				
Southern Counties Gas Co., Los Angeles, Calif.	11,530			1		253	269	395	97	2940	275	1058	4810				1088		13	606				
Southwestern Virginia Gas Co., Martinsville, Va.	35									32			3											
Southern Natural Gas Co., Birmingham, Ala.	5500					5500																		
Superior Water, Light & Power, Superior, Wisc.	28			1						5		16	5							1				
San Antonio Public Service Board, Texas	2412									1274	102	64	685	50				5	100	234				
Tennessee Gas Transmission	91,718					←———91,718———				→														
Texas Gas Trans. Co., Owensboro, Ky.	1946					1170	350	405	21															
Texas Eastern, Penna.-Jersey Trans. Co.	30,755					27,631		1572	1552															
Texas Illinois Natural Gas Pipeline	3500					3000		500																
Tucson Gas, Electric Light & Power,	500									350	50	100	40	10										
Transcontinental Gas Pipe Line	4407					←———4407———				→														
Pending	59,600					←———59,600———				→														
United Gas Improvement Co.	4700	315		6						←———3479———				→			126			774				
United Fuel Gas Co., Charleston, W. Va.	18,194	180	625		6194	9501	1015		55			453								171				
United Natural Gas Co., Oil City, Penna.	2287	379	433		400	300	75		100	405			75							120				
Union Light, Heat & Power, Cincinnati, Ohio	972									614	10	117	128	25		87			1					
Virginia Elec. & Power Co., Richmond, Va.	1222	10								830	60		266							116				
Wisconsin Fuel & Light, Manitowoc, Wisc.	70	1								55		5	2	6				1						
Wisconsin Southern Gas Co., Lake Geneva	125									45	3	19	40	7				4		10				
Water, Gas & Sewage Dept., Duluth, Minn.	132							1	1	112	6		8	8				2						
Washington Gas Light Co., Washington, D. C.	7600	30		←——830——→						3050	128	945	2070	225				100		350				
Western States Utilities, Hastings, Minn.	10									7	2	2	1											
Wisconsin Power & Light Co., Madison, Wisc.	570									151	7	301	99	6						13				
Western Kentucky Gas Co., Owensboro, Ky.	1247				250	160				255	26	212	304					10		56				
Western Tennessee Gas Co., Jackson, Tenn.	136									50	8		70	5				1		10				
Wisconsin Public Service Corp., Milwaukee	643	3					22			21	1	98	389	60			49	1						
Wisconsin Natural Gas Co., Racine, Wisc.	1416	No Breakdown																						
Westfield Gas & Electric Light, Mass.	40	5								25	3		5	3				2						
West Ohio Gas Co., Lima, Ohio	400									50		150	175	25										
Worcester Gas Light, Worcester, Mass.	1029	57								456		174	232	51		28		8		23				
Wisconsin Michigan Power Co., Appleton	213									64	2	93	15	4						37				
Zenith Gas System, Inc.	35					10	6			3		5	4	4				3						

1954 building budgets of 210 gas companies: $1.2 billion

What they mean by "other" expenditures

The multitude of items that go to make up the "Other" column at the right-hand side of the four-page table are so varied as to defy classification. They run the gamut from "tools and equipment" to plain "miscellaneous," and include such categories as meter repair shops, cathodic protection equipment, radios, and service renewals.

No effort has been made consequently to break them down.

A recapping of the allocations of several major utilities in the "other" category will serve as an indicator of the relative size of these various items in the 1954 budgets:

Brroklyn Union Gas Co., spending $680,000 for "other" items, has allocated $500,000 for compressor station modernization, $180,000 for a "safe distribution practices" program.

Cities Service Gas Co.'s total outlay, $368,000, will include purchase of motorized equipment, tools, telephone and radio communications equipment.

East Ohio Gas Co. will spend a total of $390,000, divided into $280,000 for trucks and passenger cars, $20,000 for motorized equipment, and $90,000 for stores, shops, labs, tools, and communications equipment.

Consolidated Gas Utilities Co. has budgeted $59,000 for replacement of motor vehicles and $30,000 for tools and shop equipment.

Kansas-Nebraska Natural Gas Co. has $142,000 set aside for communications, transportation, and construction equipment, as well as for tools and miscellaneous.

Minneapolis Gas Co. has divided a $699,000 budget among automobiles and trucks ($173,000), tools and construction equipment ($151,000), stores, shops, and laboratories ($51,000), and miscellaneous ($324,000).

Milwaukee Gas Light Co. has set aside a large share of its budget for "other" items. For service renewals alone, $1,250,000 is being spent. The other $650,000 is earmarked "miscellaneous."

Northern Indiana Public Service Co. is spending $1,285,000 for plant improvements, regulator stations, metering, and compressor stations.

Public Service of Newark is spending $660,000 for automotive vehicles.

Oklahoma Natural Gas Co. is splitting $828,000 into $169,000 for tools and equipment, $247,000 for automobiles, $204,000 for communications facilities, and $108,000 for miscellaneous.

Southern California Gas Co.'s $1,101,000 will be divided into $783,000 for transportation equipment, $112,000 for stores, $103,000 for tools and construction equipment, and a like amount for miscellaneous.

Washington Gas Light Co. is spending $350,000 for transportation and lab equipment.

San Antonio Public Service Board has ticketed $234,000 for tools and equipment, telemetering, cathodic protection, etc.

San Diego Gas & Electric Co.'s $126,000 will include $68,000 for microwave.

Lone Star Gas Co.'s $869,000 includes outlays for communications equipment, automotive, tools, and work equipment.

Continued from page 33

ket cultivation is calling for loops, compressors, and additional supply laterals to handle increased demands.

Of course, virgin territories do remain, and these will sustain a large order of construction in years to come. Foremost is the Pacific Northwest, where a definite forward step, in the form of an FPC certificate, is expected before the end of summer. The Atlantic seaboard will support further exploitation, too.

Perhaps most typical of gas company situations in 1954 is that of the Columbia Gas System. Just a few weeks ago, Columbia was able to announce that, for the first time since the spring of 1947, families and industries in Columbia's mid-Appalachian service territory who have been clamoring for natural gas can now be supplied.

The significance of this becomes apparent when it is noted that as of the date the announcement was made, the system still had a backlog of 100,000 applicants for spaceheating!

Columbia's new bonanza is the Gulf Interstate Gas Co. line, which will be ready to move gas into the market area by next summer. This will provide 375 MMcf for peak days, which will be augmented from underground storage.

In its present situation, Columbia typifies the entire natural gas industry in two other respects as well. Since 1946, Columbia's deliveries have more than doubled, rising from 234 billion cu ft per year to 517 billion. (From 1945 to 1952, Mr. Gonzalez reports, marketed production rose from 3.9 trillion to 8 trillion, slightly more than 100% gain.) And in the matter of supply sources, whereas the system as recently as 10 years ago drew all its gas from local sources, the Southwest area is now providing nearly 75% of send-out. (The interstate movement of gas, says Mr. Gonzalez, advanced from 1.1 trillion to 4 trillion between 1945 and 1953, with Texas and Louisiana supplying about three-fourths of the gas for interstate shipment.)

With all this, where does Columbia stand today? Like much of the rest of the distributing industry, it is spending a record amount—more than $100 million—the largest in its history. With ample gas at its gates, Columbia must now get it to the customer.

Such is the goal of the entire gas industry.

• • • • •

This is not only the latest, but it is also the most extensive coverage that has ever been attained in a long succession of annual *GAS* budget surveys.

First, more companies participated than ever before. Returns represent nearly 60% of the total of 360 major gas companies on the survey list, which has evolved through the years on a basis of geographical and market areas as well as on a simple basis of "bigness."

For the first time, the expenditures of transmission companies have been included—although the annual progress maps are also published in this issue's Pipeline Section, together with descriptions of projects approved, under construction, planned, and proposed. Some of the major planned projects included here, and in the maps, will undoubtedly fail to materialize, although some screening was done by the editors. A handful of projects that appear to be highly fanciful were purposely omitted.

TABLE 1. PRODUCTION OF MINERAL ENERGY IN THE UNITED STATES

	Amount of Production*					Energy Content of Mineral Production (Trillion Btu)		Proportion of Production Supplied by Marketed Natural Gas
	Coal - Million Net Tons			Natural Gas Billion c f				
	Bituminous and Lignite	Pa. Anthracite	Crude Petroleum (Mil. Bbls)	Marketed Production	Total Including Losses	Total Minerals†	Marketed Natural Gas	
1920	568.7	89.6	443	798		20,602	858	4.2
1929	535.0	73.8	1,007	1,918		23,796	2,062	8.7
1935	372.4	52.2	997	1,917		18,921	2,060	10.9
1941	514.1	56.4	1,402	2,813		26,060	3,024	11.6
1945	577.6	54.9	1,714	3,919		30,681	4,213	13.7
1950	516.3	44.1	1,974	6,281	6,893	32,563	6,583	20.2
1953-P	452.3	30.1	2,360	8,425		35,360	9,057	25.6

* As reported by the Bureau of Mines except for Total Production of Natural Gas, Including Losses, which is from the American Gas Association.

P-Preliminary.

† Based on marketed production of natural gas and reported net production of other mineral fuels. The unit heat values used are those reported by the Bureau of Mines of 12,700 Btu per pound for anthracite, 13,100 Btu per pound for bituminous and lignite, 5,800,000 Btu per barrel of petroleum, and 1,075 Btu per cubic foot of natural gas.

Facts and figures on natural gas

...and what they mean to the industry

By **RICHARD J. GONZALEZ, Director & Economist** • Humble Oil & Refining Co., Houston

THE largest contribution to additional domestic output of mineral energy in the United States in the postwar period has been by natural gas. Its production has more than doubled in seven years. Its increase in output has exceeded that of domestic crude oil, although crude oil was a much larger source of energy at the end of the war and has gained nearly 40% since then. Meanwhile, coal production has decreased.

As a result of these developments, natural gas has practically doubled its share in the mineral energy output of the United States. The natural gas market in 1953 had a heat content equivalent to 1.5 billion bbl of crude oil or 360 million tons of coal. Thus, it supplied about two thirds as much energy as either of these competing fuels and more than one fourth of all domestic production of mineral energy. If the postwar trends continue, natural gas may surpass coal within five years and in time even challenge oil for supremacy as our leading source of energy. (See *Table 1*, noting particularly the postwar changes in mineral energy production.)

More than half of the natural gas in the United States is produced in Texas. Much of the remaining supply comes from the adjacent states of Louisiana, Arkansas, Oklahoma, and New Mexico. These five southwestern states together account for about four fifths of the proved reserves and current production of gas. Outside of this area the principal gains in output since 1945 have been in Kansas. Production in California and the Appalachian area has been relatively static for some time (see *Tables 2* and *3*).

Actual withdrawals of natural gas exceed marketed production by the amount lost incident to oil production. Part of this loss is inevitable because the cost of gathering gas in small isolated oil fields exceeds its value. With better prices and concerted conservation efforts, the amount of gas flared has been reduced. Gas flared is now less than 10% of the total output compared with about 18% in 1945.

Additions to gas reserves from discoveries, extensions, and revisions of prior estimates have more than offset increasing production. Consequently, proved reserves have increased by 63 trillion cu ft in the past eight years. Still, they have gained only about 40% whereas production has doubled. Therefore, the relation of annual gas production to proved reserves at the beginning of the year has changed from a rate of 3.3% in 1946 to about 4.5% in 1953. These changes mean that proved reserves of gas are now about 22 times the annual output, compared with 33 times in 1946. This relation should not be interpreted as an indication that gas reserves will be exhausted in 22 years. On the contrary, so long as proved gas reserves continue to be maintained or increased by exploration and development, we can count on adequate supplies far into the future.

The decline in the ratio of reserves to annual production does suggest, however, that the rate of increase in use of gas will be more closely related to changes in reserves henceforth than in the recent past. New gaslines are generally based on availability of reserves sufficient to assure operations for at least 20 years. They have been able to expand their movement and sales recently at a more rapid rate than reserves because there were substantial amounts of uncommitted gas at the end of 1945. Gas committed to lines has kept pace with their throughput, while the amount of uncommitted gas remaining has decreased. The available supply has become tighter as a result, despite the larger amount of proved reserves.

Increasing use of natural gas

There are many facets to the changing postwar use of natural gas. Some of these are indicated by the statistics in *Tables 3-6*. The following points appear to be particularly significant.

1. The use of gas has increased more rapidly outside of the five principal producing states than within their boundaries. The gain between 1945 and 1952 was 1368 billion cu ft or

This article is an abstract of a paper presented at the American Power Conference, sponsored by the Illinois Institute of Technology, March 24-26, 1954.

TABLE 2. U. S. PROVED RECOVERABLE RESERVES OF NATURAL GAS AS ESTIMATED BY THE AGA

Area	Reserves at Beginning of Year, Billion Cubic Feet								
	1946	1947	1948	1949	1950	1951	1952	1953	1954
Texas	78,307	86,363	90,026	95,709	99,170	102,404	105,653	105,723	106,530
Louisiana	19,849	22,412	23,481	23,978	26,688	28,533	29,005	31,455	34,459
Oklahoma	10,080	10,736	11,351	11,332	11,626	11,634	11,804	11,765	12,228
New Mexico	5,190	5,905	5,990	5,606	6,241	6,991	11,590	14,039	17,522
Arkansas	870	872	890	902	874	908	931	984	1,211
Total S.W.	114,296	126,288	131,738	137,527	144,599	150,470	158,983	163,973	171,950
Southeast	3,445	3,757	3,954	3,892	3,983	3,887	3,882	3,847	4,111
California	10,856	11,126	10,164	10,193	9,992	9,760	9,482	9,340	9,159
Mt. States	2,497	2,282	2,292	4,366	4,270	4,192	4,402	4,596	6,481
Kansas	13,251	13,681	14,557	14,408	14,090	13,791	13,457	14,193	15,788
Oth. N. Cent.	920	1,029	893	1,061	1,043	1,150	1,249	1,329	1,481
No. Central	14,171	14,710	15,450	15,469	15,133	14,941	14,706	15,522	17,269
Middle & So. Atlantic	2,524	2,413	2,329	2,422	2,404	2,343	2,357	2,438	2,477
Total U. S.	147,789	160,576	165,927	173,869	180,381	185,593	193,812	199,716	211,447

TABLE 3. PRODUCTION AND CONSUMPTION OF NATURAL GAS BY MAJOR AREAS (Billion Cubic Feet)

Area	Marketed Production*				Consumption*			
	1940	1945	1950	1952	1940	1945	1950	1952
Texas	1,064	1,712	3,126	4,148	874	1,348	1,825	2,175
Louisiana	343	543	832	1,237	185	326	475	599
Ark., Okla., N. Mex.	336	509	743	946	311	412	570	680
Total S.W.	1,743	2,764	4,701	6,331	1,370	2,086	2,870	3,454
Southeast	59	86	188	248	77	133	299	432
California	352	502	558	517	352	502	684	793
Mt. States	61	72	112	141	95	139	217	273
Kansas	90	146	364	413	97	160	243	280
Tot. No. Cent.	153	243	438	470	501	718	1,414	1,767
Mid. & So. Atlantic	292	252	285	296	260	322	542	881
New England								13
Total U. S.	2,660	3,919	6,282	8,003	2,655	3,900	6,026	7,613

*Difference between production and consumption for the U. S. represents additions to underground storage, exports, and losses.
Source: Bureau of Mines.

65% in Texas and adjacent producing states, compared with 2345 billion or 130% for the rest of the United States (see *Table 3*).

2. The interstate movement of natural gas advanced from 1100 to about 4000 billion cu ft between 1945 and 1953. Texas and Louisiana supply about three fourths of the gas for interstate shipment. By 1952, interstate receipts exceeded 400 billion cu ft in Ohio and were around 300 million cu ft or more in each of three other states; namely, Illinois, Pennsylvania, and California (see *Table 4*).

3. In the years 1946-1952, natural gas was introduced into eight additional states: Connecticut, Delaware, Massachusetts, New Hampshire, New Jersey, North Carolina, South Carolina, and Wisconsin. These states had 2.4 million customers for this fuel in 1952 and their total consumption was 95 billion cu ft (see *Table 4*). Residential users represented about one fifth of the households in these states as against about three fifths in the southwestern producing states where natural gas has been used for a long time.

4. Gas was used in 41 states in 1952, the only exceptions being Maine, Vermont, and Rhode Island in New England, and Nevada,* Idaho, Oregon, and Washington in the west.

5. The number of customers using natural gas more than doubled since 1945 (see *Table 5*). The Bureau of Mines reports nearly 25 million users, including some who receive natural mixed with manufactured gas, and utilities supplying natural gas alone report some 20 million users. Of the residential customers supplied with natural gas by utilities, nearly 60% used this fuel for space or central heating, in addition to the use generally made for cooking and water heating.

6. The north central and middle Atlantic states have the largest number of customers and the largest residential and commercial consumption of gas among the geographic areas listed in *Table 5*, but the largest total use is in the southwest because of requirements in petroleum operations and by other industries.

7. Postwar changes in the major uses of natural gas reported by the Bureau of Mines have been shown in *Table 6*.

8. From 1945 to 1953 the use of gas by electric utilities has about tripled. This fuel accounts for about one fifth of the kilowatt hours generated by utilities. In the southwest and the Mountain states, gas is the most important fuel for generating electric power.

*Which now has natural gas.

The price of natural gas

Many reasons account for the rapid increase in use of natural gas in recent years. Convenience, cleanliness, and high combustion efficiency make gas an extremely attractive fuel. Technological progress in the construction of large lines capable of being operated at high pressure has also been a factor in expanding the area of consumption. But the most important reason has been the attractive price of gas relative to competing fuels.

Fuel prices may be considered from the standpoint of either the producer or consumer. Large differences may exist between these prices because of transportation and distribution costs. Both need to be considered because of their influence on supply and demand. In this case consumption has increased more rapidly than reserves, which constitutes the basic supply. Therefore, an approach from the consumer's side will be enlightening.

Indexes published by the Bureau of Labor Statistics show that wholesale and retail prices of coal and fuel oils doubled from 1939 to 1952, while natural gas showed relatively little increase. Following removal of price controls after the war, the indexes reflect

much smaller advances for natural gas than for other fuels (see *Table* 7). In many cases gas has become cheaper as well as more desirable for other reasons than coal or liquid fuel.

Average delivered prices for natural gas are listed in *Tables* 8 and 9. They are affected by the changing proportion of various uses and by the rapid growth of sales in areas remote from the point of production. In 1952 the average price paid by consumers was about 33 cents per Mcf on all marketed production of 8 trillion cu ft, including field use and other direct industrial sales, and 42 cents per Mcf on the smaller amount of 4.7 trillion cu ft sold by natural gas utilities.

Residential prices paid by utility customers are about 75 cents per Mcf, the same as in 1938, and some 20% higher than in 1945. Much of the recent increase is because of the extension of service to new areas farther removed from the source of supply. In the areas of long established substantial use by households, such as the southwest and north central states, the advance averaged less than 10% from 1948 to 1952.

Transportation and local distribution services account for about 90% of the residential price. Local distribution costs often run 50 cents or more per Mcf. The investment required in facilities to meet peak loads, particularly for heating, and the corresponding low load factor, make this change a large part of the total. It might well be billed as a fixed charge per month. The charge for transportation service varies widely with the length of the trunk line movement. For areas a thousand miles or more from the point of production it may represent more than 20% of the total price. Consumers would find it informative if their bills could be itemized in this manner, for in most cases they would find that gas itself accounts for only 10 to 15% of what they pay, while the remainder is a necessary and reasonable charge for the services required to deliver the product to their homes.

A wide range of prices exists for industrial use of gas, depending again on distance from production and on other factors. Gas consumed in field operations of the petroleum industry and for making carbon black sells for less than 8 cents per Mcf on the average. Other industrial users pay higher prices, frequently from 15 to 40 cents per Mcf, depending on the transportation cost involved, the amount and stability of the load, and whether delivery can be interrupted when the gas is needed to meet peak residential requirements.

Prevailing prices have made it attractive for many large firms, including some electric utilities, to use gas instead of other fuels. Considering heat content alone, without allowing for the higher combustion efficiency and lower handling costs for gas, a price of 20 cents per Mcf is equivalent to fuel oil at about $1.20 a barrel and to coal at $5 a ton, which figures are generally well below the prices of these other fuels. In some areas, gas delivered for 35 or 40 cents can still find ample industrial markets. Demands have increased rapidly in response to this situation, with the result that gas prices are moving toward their proper competitive level with other fuels. This development must continue if demand and supply of the several major sources of heat are to be kept in balance. On this point we must consider also the realization by producers, as that is a major influence affecting new supply.

What can be realized for any fuel is determined by competition among all producers of natural gas, fuel oils, and coal. For each of these forms of energy there are at least hundreds of suppliers. They compete not only with each other in their own industry but also with the suppliers of alternative fuels. The record of the changing participation of coal, oil, and gas in the energy markets of the United States pro-

TABLE 4. INTERSTATE MOVEMENTS OF NATURAL GAS

States with Largest Interstate Shipments of Natural Gas
Amount Shipped—Billion Cubic Feet

Origin	1945	1946	1947	1948	1949	1950	1951	1952
Texas	406	451	523	718	983	1,311	1,686	1,998
Louisiana	229	204	248	294	327	396	541	694
Oklahoma	122	150	156	206	174	200	221	228
Kansas	80	94	122	186	197	228	269	287
New Mexico	36	36	43	93	80	87	156	203
Mississippi	-	-	22	37	48	79	110	130
West Virginia	113	114	116	131	123	132	124	102
Other*	120	97	97	92	76	111	136	153
Total	1,106	1,146	1,327	1,757	2,008	2,544	3,243	3,795

*Including exports.

Interstate Receipts of Natural Gas—Billion Cubic Feet

Destination	1945	1952
New England		
Connecticut	-	1
Massachusetts	-	13
New Hampshire	-	*
Total	-	14
Middle Atlantic		
New Jersey	-	44
New York	24	190
Pennsylvania	92	302
Total	116	536
South Atlantic		
Delaware	-	3
Dist. of Columbia	7	14
Florida	7	16
Georgia	36	110
Maryland	3	27
North Carolina	-	4
South Carolina	-	3
Virginia	2	20
West Virginia	42	98
Total	97	295
Mountain		
Arizona	22	65
Colorado	34	98
Montana	3	17
Utah	14	29
Wyoming	1	3
Total	74	212
Pacific		
California	-	298

Destination	1945	1952
Southwest		
Arkansas	45	128
Louisiana	12	72
New Mexico	2	50
Oklahoma	14	23
Texas	43	66
Total	116	339
Southeast		
Alabama	43	129
Kentucky	9	69
Mississippi	34	72
Tennessee	24	103
Total	110	373
North Central		
Illinois	105	343
Indiana	39	102
Iowa	28	97
Kansas	94	163
Michigan	38	187
Minnesota	36	98
Missouri	72	172
Nebraska	28	74
North Dakota	3	4
Ohio	124	411
South Dakota	7	12
Wisconsin	-	37
Total	574	1700

*Less than 0.5 billion cubic feet.

Source: Bureau of Mines.

TABLE 5. CONSUMPTION OF NATURAL GAS BY MAJOR USES
(Billion Cubic Feet)

Area	Field Use	Pet. Ref.	Carbon Black	Electr. Utility Plants	Other Indus-trial	Commercial and Residential	Total	No. of Customers (Thousand) * Resi-dential	Com-mercial
1945									
New England	-	-	-	-	-	-	-	-	-
Mid-Atlantic	6	1	-	1	92	79	179	1,142	85
South Atlantic	13	1	-	18	60	51	143	570	46
North Central	37	11	-	66	326	278	718	5,046	334
Southwest	707	254	432	183	341	169	2,086	1,543	179
Southeast	7	-	-	14	71	41	133	381	44
Mountain	11	7	-	9	65	47	139	310	32
Pacific	136	64	-	35	95	172	502	1,967	169
Total U. S.	917	338	432	326	1,050	837	3,900	10,959	889
1952									
New England	-	-	-	-	2	11	13	651	28
Mid-Atlantic	4	13	-	41	158	329	545	6,248	489
South Atlantic	27	1	-	54	120	134	336	1,406	120
North Central	38	30	-	249	620	830	1,767	7,186	508
Southwest	1,216	408	368	392	764	306	3,454	2,658	299
Southeast	22	-	-	63	230	117	432	859	105
Mountain	22	8	-	37	103	103	273	553	71
Pacific	155	76	-	74	180	308	793	3,008	255
Total U. S.	1,484	536	368	910	2,177	2,138	7,613	22,569	1,855

*These figures include customers (1) using natural gas mixed with manufactured gas and (2) supplied with natural gas in or near producing fields but not by utilities. Therefore, utilities report a smaller number of customers for natural gas than the Bureau of Mines.

Source: Bureau of Mines.

TABLE 6. POSTWAR CHANGES IN MAJOR USES OF NATURAL GAS
Billion Cubic Feet

Type of Use	1945	1952	Change
Field use (in petroleum operations)	917	1,484	+ 567
Petroleum refineries	338	536	+ 198
Carbon black	432	368	— 64
Electric utility plants	326	910	+ 584
Other industrial	1,050	2,177	+1,127
Total industrial	3,063	5,475	+2,412
Commercial	230	516	+ 286
Residential	607	1,622	+1,015
Exports	19	27	+ 8
To underground storage (net)	-	363	+ 363
Grand total	3,919	8,003	+4,084

TABLE 7. PRICE INDEXES FOR MAJOR FUELS

	(1947-49 = 100) Wholesale Price Index				(1935-39 = 100) Consumer Price Index				
	Bitu-minous Coal	Petroleum and Products	Na-tural Gas	All Commo-dities	Bitu-minous Coal	Anthra-cite Coal	Gas	No. 2 Fuel Oil	All Items
1920	88.1	180.1	117.0	100.3					143.3
1929	48.7	69.9	110.9	61.9					122.5
1935	51.6	50.3	106.4	52.0	97.2	101.1	100.4	91.8	98.1
1941	55.6	55.9	93.6	56.8	108.2	108.5	99.3	103.4	105.2
1945	65.6	62.3	92.8	68.8	125.7	130.7	96.3	123.3	128.6
1950	105.5	103.7	98.2	103.1	200.2	195.9	103.2	180.7	171.9
1952	105.9	109.3	103.7	111.6	209.0	219.7	104.8	195.5	190.7

Source: U. S. Bureau of Labor Statistics.

vides dramatic evidence of this constant struggle.

Statistics on average prices of mineral fuels at the point of production are tabulated in *Table 10*. They show variations over a period of time in the price of each fuel, down as well as up, and in the relative costs of the major fuels. Basically, the pattern is similar to that indicated by the wholesale price index for fuels discussed previously. Some additional points may be noted. Measuring price at the well or mine in cents per million Btus for comparability, we find the following interesting facts:

1. Bituminous coal and natural gas are consistently cheaper than crude oil and anthracite coal.

2. They sold at about the same level from 1923 to 1933, but thereafter coal showed a steady upward trend while natural gas remained at lower levels.

3. At around 7 cents per million Btu, gas sells at the well for only about 35% as much as bituminous coal at the mine and only 16% as much as crude oil.

As is often the case, averages do not tell the full story in this instance. Substantial variations exist in field prices in different areas, as shown by the statistics in *Table 11*. At the well, gas sold in 1952 for an average of only 6 cents per Mcf in Texas, compared with about 15 cents in California and 20 cents in West Virginia. The national average was only about 8 cents because of the large quantities sold at low prices in the southwestern producing states. Producers in these areas are handicapped by being far from the the major fuel consuming areas. In many cases they are also selling gas under long-term contracts negotiated at depression price levels that do not reflect current costs or conditions. Newer contracts are generally at much higher figures than the averages, and the increasing quantity of such sales is raising the average.

The strong demand for natural gas under existing circumstances will continue to produce an upward trend in its price until a competitive balance is attained. The circumstances that resulted in this convenient fuel selling at

TABLE 8. PRICES PAID FOR NATURAL GAS

	Prices at Point of Consumption Reported by Bureau of Mines Cents per Mcf						Prices Reported by Natural Gas Utilities on Sales to Users Cents per Mcf				
	Residential	Commercial	Field Use	Carbon Black	Other Ind.	Total	Residential	Commercial	Ind.	Other	Total
1936	73.3	48.1	4.6	1.3	17.2	22.0	71	47	16	18	32
1941	72.0	47.2	4.4	1.1	17.1	22.1	71	47	17	15	33
1946	67 6	42.4	4.6	3.0	16.0	22.0	63	49	17	19	33
1950	69.0	47.6	6.2	4.8	17.6	26.6	68	51	20	18	37
1952	83.1*	57.0	7.8	5.5	20.7	33.2	75	57	22	20	42

*These averages are affected substantially by the influence of natural gas mixed with manufactured, particularly in New York and Pennsylvania, and apparently valued at the average price of the mixture. Adjustment of these averages to exclude the effect of mixed gas makes them comparable with the figures reported by utilities on natural gas sales to residential customers.
Source: Bureau of Mines; American Gas Association.

TABLE 10. COMPARATIVE PRICES OF U. S. MINERAL FUELS AT POINT OF PRODUCTION

	Average Prices						Average Price Per Million British Thermal Units* (Dollars)					
	Crude Oil ($ per bbl)		Pa. Bit. Coal ($ per ton)	Anth. Coal	Natural Gas (¢ per Mcf)		Crude Oil		Bit. Coal	Pa. Anth. Coal	Natural Gas	
	U. S.	Texas	U. S.	U. S.	U. S.	Texas	U. S.	Texas	U. S.	U. S.	U.S.	Texas
1923	1.34	1.48	2.68	5.43	10.0	5.1	0.23	0.26	0.10	0.21	0.09	0.05
1933	0.67	0.56	1.34	4.17	6.2	2.4	0.12	0.10	0.05	0.16	0.06	0.02
1941	1.14	1.12	2.19	4.26	4.9	2.0	0.20	0.19	0.08	0.17	0.05	0.02
1946	1.41	1.41	3.44	6.83	5.3	3.0	0.24	0.24	0.13	0.27	0.05	0.03
1950	2.51	2.59	4.84	8.90	6.5	4.7	0.43	0.45	0.18	0.35	0.06	0.04
1952	2.53	2.58			7.8	6.2	0.44	0.44			0.07	0.06

*Unit heat value employed: Anthracite coal 12,700 Btu per pound; bituminous coal 13,100 Btu per pound; crude oil 5,800,000 Btu per barrel, and natural gas, 1,075 Btu per cubic foot.
Source: Bureau of Mines.

TABLE 9. 1952 NATURAL GAS PRICES ON UTILITY SALES
(By major geographic areas)

	Price in Cents per Mcf by Class of Service				
	Residential	Commercial	Industrial	Other	Total
Middle Atlantic	96	86	42	73	73
South Atlantic	85	68	26	42	52
North Central†	75	62	31	24	52
Southwest†	61	41	13	11	21
Southeast	71	50	22	22	35
Mountain	62	47	21	14	34
Pacific	67	53	30	26	48
Total U. S.*	75	57	22	20	42

*Includes small amount of consumption in New England.
†These areas have had a substantial use of gas for many years and are least affected by extension of service into new areas on a large scale.

TABLE 11. AVERAGE GAS PRICES AT WELLS IN DIFFERENT PRODUCING AREAS

	Average Value at Wells, Cents per Mcf			
	Southwest Texas	Pacific California	Appalachian West Virginia	United States
1922	8.0	9.0	10.0	11.1
1929	3.3	8.5	17.6	8.2
1935	2.1	7.0	16.9	5.8
1941	2.0	6.0	12.1	4.9
1946	3.0	7.4	14.9	5.3
1950	4.7	11.9	16.8	6.5
1952	6.2	16.7	19.6	7.8

Source: Bureau of Mines.

ridiculously low prices were temporary and no longer exist. Extraordinary discoveries of oil and gas in the period from about 1926 through 1940 brought about a temporary surplus. Markets were not immediately available for the greatly increased supplies.

Postwar developments have entirely altered the situation. As the price of other fuels increased and transportation technology improved, scores of new gaslines were built to carry this convenient fuel to millions of additional customers. Demand advanced remarkably and a major part of the available reserves was tied up in long-term contracts. With prices still relatively attractive to customers, much larger demands may be anticipated. These increasing requirements cannot be met unless prices received by producers provide sufficient incentive to bring about a corresponding rise in discovery of new gas and in proved reserves. The choice by customers among various fuels will tend to determine the proper competitive price level. Present costs of coal and oil to consumers and other factors indicate that average field prices of about 20 cents per Mcf on new gas contracts may be required to balance supply and demand. Individual contracts will continue to be made for prices below and above such average, depending on location and other competitive factors. Furthermore, average realization on total marketed production will be below such level because of existing long-term contracts and the low price on gas used in the field.

Even if the average price of all gas sold at the well were to rise substantially over a period of years, gas producers would still realize much less for energy than producers of crude oil receive currently. At present prices, the average revenue received for a therm by gas producers is only one-sixth as much as that received by oil producers.

Part 2. Applications of economic analysis

Economics of cathodic protection

By **RAY M. WAINWRIGHT, Associate Professor** • University of Illinois

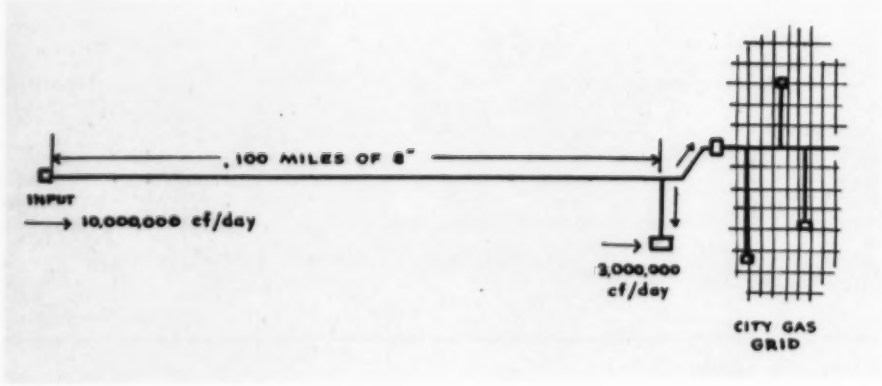


Fig. 1. Illustrative gas system.

THE first part of this article, appearing in the April issue of *GAS*, discussed money and interest, and the various methods for analyzing an engineering proposal from an economic standpoint. The second part now applies these methods of analysis to a hypothetical example that involves a corroding system and the various alternatives for corrosion control. The questions that will be answered include:

(A) What are the corrosion costs without the usual methods of corrosion control?

(B) What methods of corrosion control are available?

(C) What are the costs of these alternative methods?

(D How does cathodic protection fit into the economic scheme?

(E) What is the most economic solution to the entire corrosion mitigation problem?

(F) What is the best method of cathodic protection?

No attempt will be made in this article to cover the atmospheric corrosion problems, nor the chemical and industrial plant corrosion problems, where materials, rather than cathodic protection, form the usual solution to corrosion difficulties. The most successful applications of cathodic protection have been made in situations involving underground pipelines, mechanical underground structures of various types, underground or partially underground storage tanks, domestic hot water heaters, power plant intake and condensing structures, industrial grounding systems, docks and ship hulls, and similar situations involving metals in soils and corrosive solutions.

In evaluating costs in this article the equivalent annual cost method as previously described will be the method of analysis most used. In order to illustrate the methods, an example of a bare underground gas system will be presented. Such an example is typical of many millions of dollars invested in natural gas transmission lines and distribution systems in this country prior to, say, 1930. Before approximately that time it was considered good practice to use thicker metal pipe walls to combat corrosion instead of the coatings and electrical protection of today. Many of the older bare gas systems are now reaching a point where corrosion costs are becoming self-evident, and management is exhibiting more and more interest in modern control methods.

Fig. 1 shows a hypothetical gas system composed of 100 miles of 8-in. bare steel all-welded transmission line, serving a load made up of a single gas distribution system at the end of the line (city of approximately 50,000) plus an additional load of about 3 MMcf per day. The average input to the line is 10 MMcf per day, and this rate is anticipated to stay substantially constant for the near future. Input gas costs 12 cents per Mcf including the cost of compression.

By an unaccounted-for-gas study it is determined, for the system of *Fig. 1*, that gas lost in the transmission line is 20% of the line input, and that gas lost in the distribution system is 12% of the town border input. Leaks are occurring on the transmission line at the rate of 30 per year. Leaks are occurring on the distribution system at the rate of 100 per year, and a vegetation survey is being run once a year as a precaution.

For certain portions of this study to follow, the above system will also be considered as a new system about to be constructed, in which case the economic solutions to the corrosion problem will, in general, be different.

(A) Corrosion costs

For the corroding system cited above, the corrosion costs may be calculated as follows:

GAS exclusive

(1) Annual cost of lost product because of corrosion: Assume that one half of lost gas is due to corrosion. Then the cost of lost gas on the transmission line is

$$\frac{1{,}000{,}000}{1000} \times 0.12 = \$120 \text{ per day, or}$$

$\$120 \times 365 = \$43{,}800$ per year.

For the distribution system,

$$\frac{(10{,}000{,}000 - 2{,}000{,}000 - 3{,}000{,}000)}{2}$$

$\times 0.12 = 300$ Mcf per day from corrosion causes.

Then,

$$\frac{300{,}000}{1000} \times 0.12 \times 365 = \$13{,}140 \text{ per year.}$$

The total annual cost of lost product because of corrosion is, then, $56,940.

(2) Annual cost of loss in revenue: Leakage on the transmission line will affect adversely the total line capacity. This comes about because it is necessary to transmit the gas that feeds the more remote leaks. The capacity will be reduced by some figure lower than the total loss of 1.3 MMcf per day (only the capacity reduction due directly to corrosion is considered here). A rough rule of thumb might be taken for the reduction of the example as:

$$(\text{distribution loss}) + \frac{(\text{transmission loss})}{2} \quad \text{Eq. 1)}$$

or

$300{,}000 + 500{,}000 = 800$ Mcf per day.

May not be important

If the line is not operated at capacity, then this loss reduction may not be important. But if the extra capacity represents gas that could be sold at the line output, then the available revenues are reduced accordingly.

Assume for the example in question that this extra gain in capacity could be utilized by sale of gas to the single large industrial user at a price of $0.10 per thousand *above* current operating costs. Then the state of the property is causing a loss in dollars of

$$\frac{800{,}000}{1000} \times 0.10 \times 365 = \$29{,}200 \text{ per year.}$$

(3) Cost of leak repairs, including damages to landowners for excavations and crop destruction:

Some companies estimate that transmission-line leaks cost from $150 to $300 each on the above basis.[1,2] If $200 is assumed for the example, this portion of the costs amounts to: $200 $\times$ 30 = $6000 per year.

For the distribution system a lower corrosion leak cost is assumed of $50 per leak. This gives: $50 $\times$ 100 = $5000 per year.

The total yearly leak repair cost is then: $5000 + $6000 = $11,000 per year.

(4) Cost of engineering, testing, and other overhead because of excessive corrosion leaks:

A certain amount of such costs are normal for average line operations. However, for very leaky systems, some increase in overhead costs is necessary. For the system of the example this extra cost will be neglected.

(5) Increase in annual depreciation charge because of shortened life of pipeline or metal structure:

Interest assumed

An interest rate for money must be assumed to compute this cost. For a reasonably large company a rate of 6% (compound annually) is assumed here to be adequate. This rate represents a compromise between rates on bonds, stockholders' money, bank money, underwriters' costs, risk adjustments, and other factors.

If it were not for corrosion, the life of the lines might be estimated in excess of 100 years, providing obsolescence does not bring about a shorter life. For the purposes of the example, 60 years will be assumed as the life without corrosion, and 30 years with corrosion present. These life assumptions represent a *change* in sinking fund factor of

$1.265\% - 0.188\% = 1.077\%$.

Therefore, the *change* in annual depreciation charge due to corrosion is approximately 1% of the initial cost of the line. If the initial cost of the system of the example is $2.5 million, this corrosion cost is approximately: $2{,}500{,}000 \times 0.01 = \$25{,}000$ per year.

If the corrosion is at all severe, such that the life is reduced to, say, 10 years instead of 30, then the change in the sinking fund factor would be 7.399%, and the corrosion cost would have been: $2{,}500{,}000 \times 0.07399 = \$184{,}875$ per year. It is evident that the depreciation charge becomes a most important cost for rapidly corroding pipelines.

The sum of the corrosion costs under paragraphs (1), (2), (3), (4), and (5) is now

	$ 56,940
	29,200
	11,000
	25,000
	$122,140 per year of direct corrosion costs.

To this figure on direct costs should be added an estimate of certain typical indirect costs. A check list of such costs might include:

(6) Cost of extra steel in pipelines to combat corrosion.[3]

(7) Standby equipment costs.

(8) Evaluation of loss of public good will because of excessive repair programs and poor service continuity.

(9) Damage suits because of corrosion leaks and explosions resulting therefrom.

(10) Higher money rates because of poor condition of plant.

For the example being considered, the following assumptions will be made:

For (6) above it will be assumed that the extra steel necessary in the transmission line to combat corrosion is 10 lb per foot. No change will be assumed in weights of distribution pipe. Using a rough figure of $100 per ton of steel, and no change in fabrication charges, the calculations give: $10/2000 \times \$100 \times 5280 \times 100$ miles = $264,000 initial cost.

To convert this amount to an annual charge, a multiplier may be used made up of the capital recovery factor for the uniform series plus 0.04 to account for taxes and insurance. Thus for n = 30, i = 0.06,

$$264{,}000\ (0.07265 + 0.04) = \$29{,}740. \quad \text{Eq. 2}$$

The costs under (7) and (8) above will be assumed negligible for the system under consideration.

Under (9) above it will be assumed that experience has shown the probability of one major explosion because of a corrosion leak in 20 years. Actually this is a rather conservative estimate. Many gas companies have experienced worse losses. If the average settlement is estimated at $30,000 to occur at the end of 20-year periods, the annual charge for this risk is

$R = S\ (SFF_u)$, for n = 20, and i = 0.06, Eq. 3

$R = \$30{,}000 \times 0.02718 = \$815$ approximately.

Under (10) no change in money rates will be assumed.

The total indirect costs may now be found as

$29,740
815

$30,555

and the total corrosion costs are, then,

$122,140
30,555

$152,695 per year.

(B) Corrosion control methods

The next question to be answered is: What methods are available to combat corrosion and eliminate the costs of the above paragraphs (A)? The answer is, briefly, *coatings* and *cathodic protection*. Some engineers would add also changes to other materials such as plastics, but this solution seems at the moment much more costly than the use of steel or ferrous alloys, together with the usual coatings and cathodic protection, under current pressures and operating conditions.

Coating's single purpose

The single real purpose of a coating is to electrically insulate the corroding metal surface from the soil or solution. Any coating that does this, and which can maintain its electrical insulating properties over an extended period of time, is a good coating. Low water absorption, good bonding characteristics, resistance to chemical attack, and resistance to mechanical stresses are all important factors in determining a good coating, only because these factors contribute toward long term insulation properties.

Obviously, such coatings as a thick layer of neoprene, or some other good plastic insulation, would meet the requirement of high electrical insulation with good life and high stability. By the use of such materials the presence of coating flaws, or holidays, could be kept to an absolute minimum; however, the cost would be very high as compared to certain other available materials. Coal-tar enamels, asphalts, and waxes are three types of coating materials that have been used by the industry. These are relatively cheap, and have reasonably good insulating properties. Coating flaws are invariably present in such materials, but with the use of cathodic protection the flaws may be prevented from becoming anodic (corroding area), and satisfactory corrosion control is still possible.

Cathodic protection by itself may be used as a corrosion control method in many cases; however, it is likely to cost more than a combination of coating and cathodic protection together.

(C) Cost of corrosion control

At this point the question may well be asked: What are the costs of the various methods of corrosion control?

Going back to the previous example of *Fig. 1*, a few assumed calculations will be presented: Suppose the $2.5 million system were being installed today. The cost of a good coal-tar enamel coating of 3/32-in. thickness, wrapped with a 15-lb pipeline felt (or a competitive fiber glass wrapper), would probably add another $400,000 to the original uncoated cost of the system. Assume thereby that the steel content of the transmission line might be reduced by about 30%, that the life of the entire system would be increased to 60 years instead of the assumed 30 years, and that all of the annual corrosion costs as outlined previously might be considered to vanish. This implies that an investment of $400,000 has prevented an annual charge of $152,695. The return on incremental investment is here, by the method of Equation 2,

$$(CRF_n + 0.04) = R/P = \$152,695/\$400,000 = 0.38174$$

where n = 60, and i = 0.34 approximately. The 0.04 in the formula accounts for the taxes and insurance on the coating investment. The rate of return on the investment here is about 34%, a phenomenal rate, to say the least. Even if the coating reduced corrosion costs by only one third, the investment would still pay over 10% return.

As an alternative to coatings, cathodic protection will be assumed for the entire bare transmission and distribution system. From experience factors it will be supposed that an average current drain of from 1 to 2 milliamperes per square foot is necessary to protect the underground system of the example. The transmission line presents as surface area

$$5280 \times 100 \times 8.625/12 \times \pi = 1,190,000 \text{ sq ft}$$

The distribution system will be assumed to contain 70 miles of equivalent 4-in. main, or approximately 370,000 sq ft of metal surface.

The current requirements are, then, assuming 1 ma./sq ft,

transmission line	1190 amps
distribution system	370 amps

For the purposes of this discussion the arbitrary choice will be made that the transmission line will be protected with rectifier power sources, and that the distribution system will be protected with magnesium anodes. Since rectifiers create a large amount of overprotection near the connection to the pipeline, the total rectifier output must be increased by a *distribution factor*, which usually ranges from 2 to 6 or more. Assuming a distribution factor here of 3.75, the direct current required for the transmission line is

$$1190 \times 3.75 = 4463 \text{ amps}$$

An assumption will be made that this current will be supplied by 100 rectifier units, of rating 20 volts, 50 amps, having an average input of 1.5 kw each. These rectifiers with associated power lines will cost, say, $1800 each station or a total of $180,000. The annual cost of the rectifiers may then be computed as follows:

Initial investment: $180,000.
Salvage: assumed zero.
Life: assumed 10 years, including ground beds.
Maintenance charges and operating charges, exclusive of power costs: $10,000 estimated) (annual).
Power: assumed at 2 cents per kwhr.

Depreciation plus interest on investment: 180,000 (CRF_n) for n = 10, i = 0.06 = 180,000 × 0.13587	$24,457
Taxes and insurance (at 0.04)	7,200
Operation and maintenance	10,000
Power costs, annually, are: 100 × 1.5 × 8760 × 0.02 =	26,280
	$67,937

Computation results

The result of this computation shows that the annual charge for rectifiers is approximately 38% of the initial cost of the units installed. This figure compares favorably with actual situations where the figure is usually given as 35% to 40%.

The annual cost for magnesium anodes for the distribution system may now be calculated as follows: Assume that 17-lb anodes will be used, and that each anode will put out an average of

50 milliamps in the soil conditions prevailing. For anodes a smaller distribution factor may be used, since the sources of direct current are small and close together and very little over-protection results. Using a distribution factor of 1.5, the anode requirements are

$$\frac{370 \times 1.5}{0.05} = 11{,}100 \text{ anodes.}$$

The installed cost of each anode may be taken as $20 each, giving a total intial outlay for anodes of

$$11{,}100 \times 20 = \$222{,}000.$$

In accordance with the manufacturers' data, the life of the anode will be taken as 20 years on the average. If operation and maintenance of the anode system is estimated at $5000 per year, the annual costs are

$222,000 ($CRF_u$) for n = 20, and i = 0.06 = $222,000 × 0.08718 =	$19,354
Taxes and insurance at 0.04	8,880
Operation and maintenance	5,000
	$33,234

The total costs of cathodic protection are now

	$ 67,937
	33,234
	$101,171

In order to compare this figure with coating alone, the annual cost of the coating is

$400,000 × 0.06188	$24,752
Taxes and insurance	16,000
Operation and maintenance	(negligible)
	$40,752

For the computations so far the comparative costs are

System without protection	$152,695
Coating alone	40,752
Cathodic protection alone	101,171

In all three of these cases it was assumed that the conditions prevailed from the installation of the system. If the system were installed as bare pipe, then either the coating or the cathodic protection decided upon later, both the second and third costs would have to be considerably modified. The coating cost would increase enormously if the line were picked up and coated after it were once in place. The cathodic protection cost would increase slightly, depending upon the cost of preparing the system for cathodic protection. This would include costs of bonding any insulating couplings, insulating the distribution system at the meters to disconnect it from foreign systems, and other similar charges. The total cost of such work could be reduced to an equivalent annual charge by multiplying the initial cost by the (CRF_u + 0.04) as in Equation 2. The CRF_u for the example given would be for n = 60, and i = 0.06. This neglects operation and maintenance on the preparation work, since this annual charge should be small.

(D) The role of cathodic protection

How does cathodic protection fit into the economic scheme? Its role here may be three-fold: (a) It may be used as total protection on a new line, although this is usually not the best economic solution. (b) It may be used to extend the life of an old line, either as a precautionary measure, or as an alternative to an immediate replacement. (c) It may be used in conjunction with coatings as an ultimate method for corrosion control.

The example worked out above illustrated the fact that cathodic protection may be cheaper than letting the line corrode without any protection, even if the initial line is without coating. As an example of the use of cathodic protection in lieu of reconditioning, suppose that one mile of the transmission line for the example above is to be reconditioned, with the assumption that the one-mile job will cost $20,000. If the line would now last for 60 years, a very optimistic prediction indeed, the annual cost of the reconditioning would be $20,000 × 0.06188 = $1237 per year.

This same mile could be protected electrically for, say, $2000 initial cost. Using 40% as the multiplier to convert to annual cost, the annual cost of cathodic protection for the mile would be $2000 × 0.40 = $800 per year. In practice the saving over reconditioning may run as much as 5 to 1.

In conjunction with coatings, cathodic protection is a virtual necessity. Coatings alone will not eliminate all corrosion. Corrosion will be reduced, of course, and the total amount of metal removed will be smaller. However, pits are known to develop at flaws in coatings, and the kind of coatings that have been found economically feasible do not necessarily maintain perfect electrical insulating characteristics with time. For this reason, good judgment would indicate that a combination of coatings and cathodic protection be used. In this case there is no need to go to an elaborate and expensive coating, but merely to a coating that will *reduce the cost of cathodic protection.*

(E) The optimum corrosion control solution

The optimum corrosion control solution seems to be the use of reasonably good coatings with cathodic protection. The coating should be one that is known to maintain its insulating properties with time, together with a wrapper to give mechanical strength and to prevent coating flaws during construction and during future soil movement, and a reasonably good coating inspection procedure to eliminate as many flaws as possible. There seems to be no necessity to spend an excessive amount of money "jeeping" a coating, since cathodic protection will maintain the metal cathodic at the flaws and no corrosion should take place.

For the example of *Fig. 1,* a calculation follows to determine the cost of coating with cathodic protection:

The initial current requirements for cathodically protecting a well coated line are likely less than ½% of the requirements for a bare line. However, the fixed charges will cause the cathodic protection costs to be somewhat higher per amp. For the example in question, the initial cost of cathodic protection for the entire system will be assumed as $20,000. Forty percent of this amount will represent the annual charges or $8000 per year. Using the previously obtained figure for coating alone, the total will be $40,752 + $8000 = $48,752 per year. This assumes rectifier protection rather than sacrificial anodes. In either case, however, the saving is very large as compared to the cost of corrosion without protection, $152,695.

The foregoing example bears out the general rule-of-thumb stated in previous literature[1] that annual corrosion costs normally run between 2% and 5% or more of an initial investment, and that complete corrosion control by coatings and cathodic protection can be obtained by annual expenditures of 1% to 2% of the initial investment.

Appliance preferences revealed in GID "Test City" survey

One of the 10 so-called "test cities" in the Gas Industry Development Program (GAS, March 1953, page 37) is Lincoln, Neb., served by the Central Electric & Gas Co. As the first step in the test, Central Electric hired Central Surveys Inc., of Shenandoah, Iowa, to conduct a combined market research and public relations sampling. The following are excerpts from the findings, based on interviews with 1000 customers, as reported by Fred C. Danforth, secretary of Central Surveys, at the Mid-West Gas Association convention, Des Moines, March 15-17:

A SURVEY of installed appliances showed gas ranges outnumbering electric 4 to 1, but there are relatively more new electric ranges in customers' homes than new gas ranges. Only about 3% have gas refrigerators; about one customer in eight has a dryer, and electric models outnumber gas 2½ to 1. (A high proportion of dryers are owned by younger families, with children, and it is people in this category who are most interested in buying them. Reactions of those who own them are enthusiastic.)

Gas is the overwhelming preference for water heating.

An analysis of opinions of gas ranges showed that, by a ratio of 30 to 1, customers felt that gas ranges cost less to buy than electric; by 3 to 1, they believed gas cost less to operate.

Electric cooking is making inroads (as it is almost everywhere). Twenty-one percent now cook electrically, 48% would prefer to do so, "indicating the need for an aggressive and well coordinated advertising and sales campaign on gas ranges."

The market "is obviously among present owners of gas ranges. Few electric range owners show any inclination to switch to gas and . . . the big majority of electric ranges are relatively new."

Speed and economy

This and other surveys showed that it is generally conceded by most customers that gas ranges have two basic advantages —speed and economy. "So, stressing these as the most important factor in buying a new range should be more effective than any other presentation built on something contrary to the average Lincoln housewife's own thinking."

Any claims, even though true, that gas ranges are more modern, more automatic, safer, or keep the kitchen cooler would run exactly counter to the beliefs of an overwhelming majority of Lincoln housewives, who attribute these particular advantages to electricity.

"Of course, it would be a negative approach and defensive in tone to say in effect that gas is 'just as clean,' 'just as modern,' 'just as automatic,' etc., and it might even build up the importance of these key arguments of the competition. So it appears best to deal with these factors by indirection—through demonstrations of specific features of gas ranges that are obviously modern, obviously automatic, obviously easy to clean, and obviously safe.

"Further analysis indicated that the market is a broad one as to income levels —there are a surprising number of old gas ranges in well-to-do homes.

Dealers need help

"Some types of appliance dealers—appliance and hardware stores—apparently need help in pushing gas ranges. Both these types of dealers had a declining share of the market the last few years and in both appliance and hardware stores sales of electric ranges, in proportion to total ranges sold, have been above average."

In the case of water heaters, by emphasizing speed and economy (plus habit and greater familiarity with gas water heating) it should be possible to hold virtually all present customers and gain a few dissatisfied electric model users. Nearly all present gas users are well satisfied.

The dryer market is growing, but intensive selling of gas models is needed lest they continue to be badly outsold. Greater familiarity with gas models and awareness that they are available must be developed. Many prospective customers do not know they even exist. Those who do are not aware that they cost less to operate; and any higher first costs, real or imaginary, can be minimized when monthly payment plans are used.

Briefly: greater emphasis is needed on availability of installment selling (many will buy major appliances this way, but are not aware the company will sell on installments); television should be used, along with newspaper advertising, particularly for its value in demonstrating modernity, automatic features, etc.

These figures apply, of course, primarily to pipelines in average soils.

(F) Rectifiers vs. sacrificial anodes

The question, What is the best method of cathodic protection? is actually not capable of being answered except in specific cases. The two principal methods of cathodic protection available are rectifiers and sacrificial anodes, such as magnesium or zinc. Each method has its advantages and disadvantages, and its best area of application. Usually rectifiers are used where power is obtained readily, and where the potential gradients set up in the earth do not cause significant currents on neighboring metallic structures. Rectifiers are used frequently on long cross-country transmission lines.

Sacrificial anodes are popular for distribution system protection. The distribution factors are smaller, and the potential gradients in the earth are much less. However, available source voltages are lower also, and the current output may be limited in certain soils. Other significant factors are the cost of power in a particular case, the soil resistivity, costs of labor and materials, and other similar factors. Before a choice can be made distribution factors should be obtained from experience and from tests and engineering studies on the system to be protected.

Conclusion

The author believes that the correct and optimum solution for corrosion in most underground applications is the use of coatings plus cathodic protection. Economic studies invariably show that this solution is practical. In many cases cathodic protection can be used with substantial savings on bare or poorly coated lines as a substitute for reconditioning.

When coatings are used in conjunction with cathodic protection, a reasonably good coating, reasonably free from flaws, is indicated. Double coatings and excessive flaw detection is of dubious economy.

References

1. Wainwright, Ray M., Economic Aspects of Cathodic Protection, *Corrosion*, 9, 51-55 (1953), February.
2. Doremus, Doremus & Parker, Engineering Aspects of Cathodic Protection as Applied to Pipelines, *Corrosion*, 5, 273-281 (1949), September.
3. Peabody & Woody, Experience and Economic Benefits from Cathodic Protection on Gas Distribution Systems, *Corrosion*, 5, 369-377 (1949), November.

Part 2. Case studies in cost reduction

GAS exclusive

Cutting costs in the distribution department

By **GEORG BABBE, Staff Engineer** • Southern California Gas Co., Los Angeles

THE fellow who first coined that old saw, "A penny saved is a penny earned," obviously was never exposed to corporate bookkeeping. Any industrial engineer can tell you that a penny saved is worth several pennies earned. Sleight of hand? No, just applied accounting. Let's get the facts, ma'am.

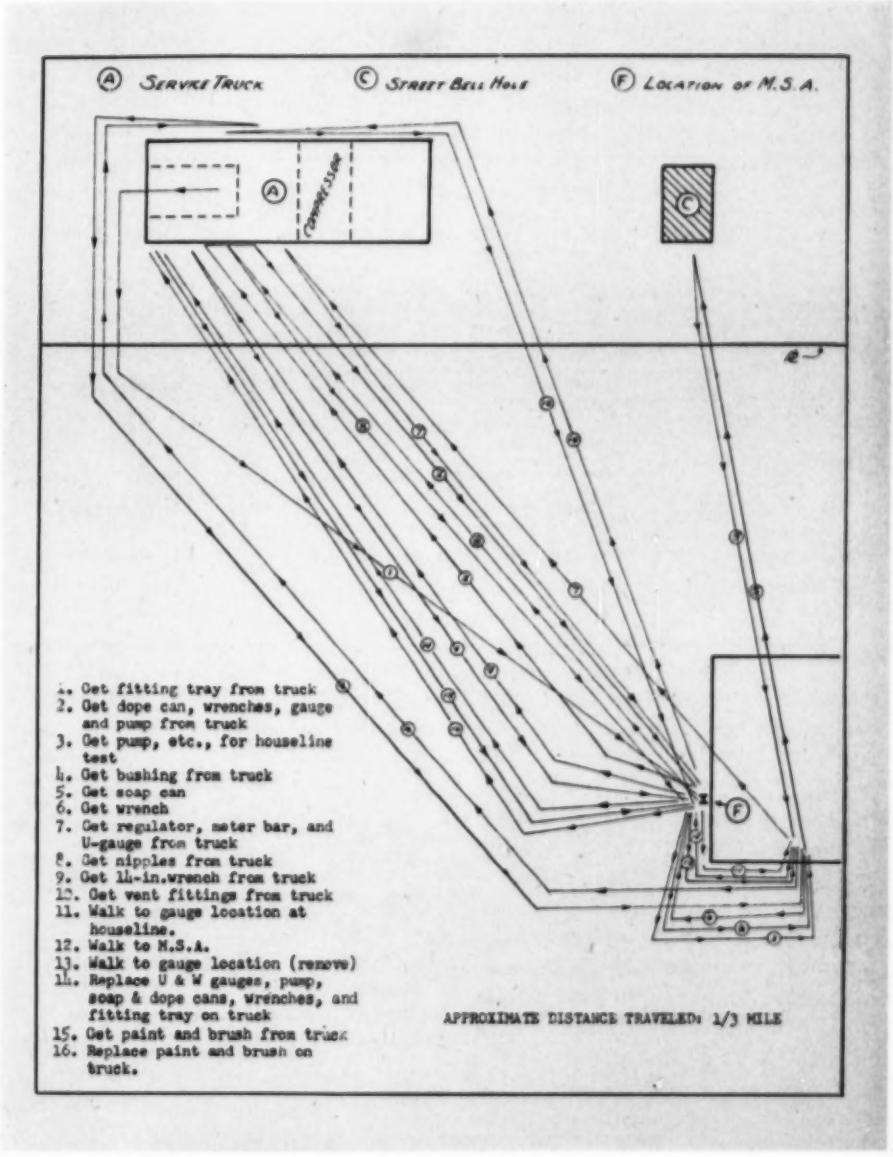
Company A has gross earnings of $100 and expenses of $90—net profit of $10. (This, needless to say, is a hypothetical example designed to simplify calculations.) In a vigorous attempt to improve its profit position, Company A stirs up its sales force and increases its sales to $110, with the same sales-expense ratio. With gross earnings of $110 expenses are $99—net profit $11. The sales manager gets a handsome bonus, of course.

Now, let's look at Company B with the same initial earnings position: $100 gross—$90 expenses—$10 net profit. Company B has the same desire to improve its earnings, but tries a different approach. Rather than drumming up its sales, it puts the heat on those $90 expenses and sweats them down to $89. The result? Sales $100—expenses $89—net earnings $11. The chief industrial engineer is given a stern reprimand for not reducing costs earlier, with his only satisfaction the knowledge that a dollar saved is the equivalent of several dollars of increased sales.

This illustration is *not* intended to inspire a campaign to replace all salesmen with industrial engineers. Obviously, the really successful organization is Company C which increases its sales to $110 while holding its expenses to $89. Such an analysis of the impact of cost reduction on net profit does serve, however, to highlight the importance of getting the most value for every dollar spent on company operations.

Last month we discussed the advantages of a comprehensive cost reduction program as an effective means of supplementing the activities of operating supervisors in their day-to-day assignment of getting the most value for every dollar. We also reviewed a general method for getting such a program underway on a sound basis in the distribution department.

In this article, let's consider the techniques that have proved successful in


A Service Truck
C Street Bell Hole
F Location of M.S.A.
1. Get fitting tray from truck
2. Get dope can, wrenches, gauge and pump from truck
3. Get pump, etc., for houseline test
4. Get bushing from truck
5. Get soap can
6. Get wrench
7. Get regulator, meter bar, and U-gauge from truck
8. Get nipples from truck
9. Get 1¼-in.wrench from truck
10. Get vent fittings from truck
11. Walk to gauge location at houseline.
12. Walk to M.S.A.
13. Walk to gauge location (remove)
14. Replace U & W gauges, pump, soap & dope cans, wrenches, and fitting tray on truck
15. Get paint and brush from truck
16. Replace paint and brush on truck.
APPROXIMATE DISTANCE TRAVELED: 1/3 MILE

Case 1. A charting of the actual travel done by an employee in erecting a meter set assembly indicates graphically what can be accomplished through time-and-motion studies such as are advocated by the author in this installment.

improving methods and reducing costs. We'll cite some specific examples of improvements in distribution operations that have been obtained through the application of these techniques.

The problem

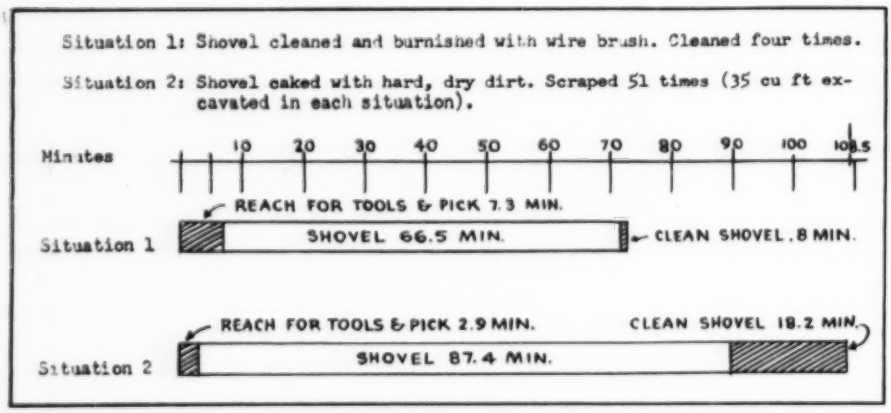
You've been assigned the job of reducing distribution department costs as part of a broad program. As a result of some preliminary investigations and bench-mark cost studies, it's been determined that improvement of a particular field operation appears to offer the greatest potential savings. Your job is to find the most economical way of performing this operation to satisfactory standards of quality.

How to go about it? Essentially, you will have to do three things: observe, measure, and analyze. In order to arrive at the most economical combination of manpower, tools and equipment, the first thing you must do is watch the operation as it's now being performed. Perhaps in one district the job is being done with a crew of four men and some hand tools; in another with three men and power tools. And you may want to try it with two men and some heavy construction equipment to make certain you have observed all possible methods that appear to have merit.

In addition, in order to get factual information about comparative costs for these alternate methods, you will have to measure and record the results of each.

In some situations (as in *Case 1*), the indicated improvement may be so obvious that no measurement is needed. In general, however, the solution is not so simple and some objective measure of cost is required to determine the most economical alternative. Since job costs are a function of time—time for men and time for equipment—a measurement of the time for each element of the job will provide a basis for subsequent cost analysis. The use of a stop watch in making time studies has this as a goal. (We'll discuss in the next article another broader application of time study data.)

On the basis of observations and time measurement of existing and new procedures, an analysis can be made of the most economical combination of men, tools and equipment for a particular job. In some cases, of course, cost may not be the final determinant in selecting the best method; employee and public relations frequently are overriding considerations. For example, you may very well conclude that blasting is the cheapest way of breaking pavement for main installations. Protests of irate customers along the street will probably convince you in short order that a slightly more costly technique is more generally suitable.



Case 2. Shovel maintenance and excavating time. Soil: Chino clay loam.

Effect on other operations

Another factor in analyzing cost for a particular operation is its effect on the cost of other operations. As we'll see in *Case 4*, higher costs for particular operations may be worthwhile investments in reducing overall job costs.

In utilizing the results of any methods study, two limitations should be emphasized. Such a study indicates the best method (1) at this time, and (2) for this volume of work.

One of the hallmarks of America's industrial progress is our chronic dissatisfaction with things as they are. No matter how good a tool or piece of equipment may seem at the moment, someone will have a scheme for improving it. Consequently, if you've come to a conclusion as to the best method based on the performance of the Acme Model A Trench Combobulator, remember the Acme people are bound to come out with a new, improved Model B Dynapowered Super Combobulator—with hydromatic steering—whose performance may throw your conclusions in a cocked hat. Or they may cut the price of the Model A by 33.8%, with the same effect on your original conclusions. Remember that methods studies to be valid must be current, which necessitates periodic reappraisals of past decisions.

The second consideration in evaluating a methods study is the volume of work to which it relates. To illustrate, one excavation method may be most economical for an isolated bell hole but prohibitive for a trench or series of smaller excavations. In recognition of this, the most useful methods studies evaluate comparative costs for alternate methods over the entire range of work volume that may be encountered on a particular type of work. In all likelihood, cost relations will change with changes in the amount of work.

Case studies of cost reduction

Methods studies of this sort can lead to very significant cost reductions by disclosing opportunities for improvement in tools and equipment, in job safety, in job methods, and in crew organization. Each of these areas of possible cost reduction is discussed below, with some specific examples of the results obtainable. It should be noted that these examples are not presented as the most economical method for your own particular operations. As we have discussed earlier, such analyses are predicated on the wage schedules, equipment rental rates and equipment performance that obtain at a particular time and in a particular organization; it is very unlikely that the same cost relationships would exist in another company or even in the same company at some later time. To emphasize this, the cost curves shown in these examples have been generalized as much as possible. They are presented only as an indication of the improvements that can be obtained through methods studies.

Hiker or pipefitter?

An example of cost reduction obtained through improved equipment is

Case 3. Generalized cost comparisons for various methods of breaking concrete, including repair costs.

shown in *Case 1*—a one-man materials handling project, if you will.

The travel chart shown in *Case 1* was typical of the walking done by many pipefitters in building a meter set assembly, when supplied with an inadequate and poorly designed tool and fitting tray. No time measurement was needed here to disclose the need for a tray that would hold all the tools and fittings required to build, test, and paint most meter set assemblies. The development of such a tray led to a substantial reduction in the amount of hiking required, a significant improvement in meter-set assembly production—and a sharp decline in the sales of bunion plasters to pipefitters.

Incidentally, this same sort of travel chart for crew operations on other types of work is an invaluable aid in designing the standard truck bodies discussed by Frank Chapman in the April issue of this magazine. It serves to establish the "traffic pattern" around a truck, the sequence of operations requiring various tools, the volume of use of particular fittings, etc.

The case of the shiny shovel

If yours is a typical distribution department, you only think you're in the gas business. Actually most of your costs result from breaking pavement and moving dirt. Consequently, anything you can do to reduce your excavation costs will materially improve your performance on pipe installations or leak repair operations.

Case 2 shows the results of methods improvement applied to shoveling, the *sine qua non* of the gas industry. Not a very spectacular operation, admittedly, but one entailing much more skill than the sidewalk superintendents realize. Furthermore, although shoveling is a relatively low unit cost activity it is such a high-volume operation that any improvement can accrue major savings over a period of time.

Improvement: 30%

The bar charts in *Case 2* show the 30% improvement in production resulting from cleaning the shovel mirror bright before using it in a moist heavy soil. This study also illustrates the benefit of a time study, incidentally. Without stop-watch measurement, this detailed appraisal of the advantages of preliminary equipment preparation would be difficult to make, and no basis would exist for estimating possible benefits obtainable in other situations.

Safety and savings

If you question the appropriateness of a discussion of safety in an article on distribution cost reduction, just ask your safety engineer how much you're paying currently for every accident in your department. The total of direct costs plus the indirect legal, medical, and compensation costs is staggering. The facts will convince you, I'm sure, that those protective goggles and toe guards, the time taken to maintain pneumatic equipment and your other safety measures are not only good employee relations—they're also good cost reduction measures.

Furthermore, the pressure control fittings and equipment designed to permit operations in a gas-free atmosphere are excellent production tools as well as safety devices. Each is designed to do a specific gas handling operation in the most expeditious manner. With them you get savings with your safety.

The fine art of making little ones out of big ones

The advantages of installing a main in a public right-of-way all too frequently entail the parallel disadvantages of having to work on a main only after breaking a heavy layer of case-hardened concrete paving. During the past several years, two developments have been introduced that may offer some relief in this respect: concrete sawing and truck-mounted or self-propelled pavement breakers.

The use of a diamond edge circular saw for scoring concrete on either edge of a trench cut is an example of an operation that must be evaluated in relation to current prices and local conditions. At the present time in the Los Angeles area, although the fracture planes set up by the sawing operation do facilitate the breaking and removal of pavement, the resulting savings do not offset the additional cost of the sawing operation. In certain municipalities, however, the use of the saw cut is used as a basis for reducing the amount of pavement broken back along the edge of the trench prior to permanent resurfacing, the straight vertical face of the saw cut being considered a satisfactory joint between the old and new pavement. On the heavier, more expensive pavements, this saving more than offsets the added cost of saw cutting. With improvements in saw blades and cutting equipment, this operation will undoubtedly become more generally economical.

The use of heavy pavement breaking equipment is closely related to the economics of concrete sawing. A study

CASE 4. ANALYSIS OR NARROW TRENCH OPERATIONS

(6-in. wrapped steel main replacement; 8½-in. concrete pavement; wide trench: 20-22 in.; narrow trench: 12-14 in.)

Operation	Ratio of narrow trench costs per trench foot to wide trench costs (%)
1. Breaking and loading paving	71.7
2. Digging to expose substructure	103.8
3. Belling out trench for welding	113.7
4. Bellhole welding	105.5
5. Backfilling	63.5

Major cost reduction obtained as result of decrease of permanent resurfacing area by approximately one-half sq ft per trench ft, at $1.20 per square foot reinforcing.

made three years ago in the Los Angeles area showed the cost relationship illustrated in *Case 3* for various methods or combinations of methods of pavement breaking with and without saw cuts.

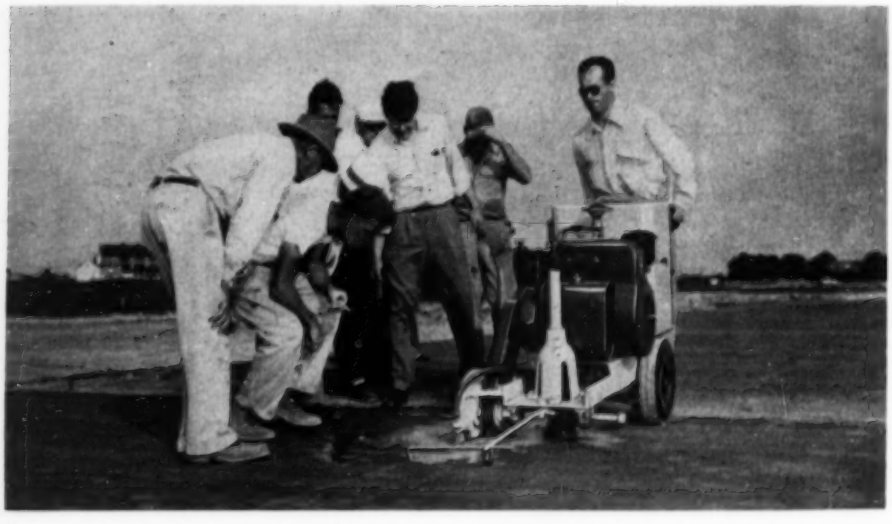
This is for the total cost of paving removal and replacement and reflects the reduced cost for permanent paving repairs obtained through the use of the concrete saw. As you can see, the combined effect of faster pavement breaking and reduction of the area requiring permanent resurfacing results in savings of some 15% over slower hand methods.

Excavation and cost reduction

As I've indicated earlier, excavation costs are typically a major portion of a distribution department's total expenditures. What can be done to improve excavation methods? One of the industrial engineering axioms is that the best way to improve an operation is to eliminate it. Unfortunately, excavating can't be completely eliminated but the amount of excavating can be significantly reduced. For example, Peoples Gas Light & Coke Co. in Chicago has developed equipment and techniques for doing many operations on low-pressure mains through a 1-ft square opening in the street. Southern California Gas Co. has also done considerable work toward reducing the width of main trenches to the practical minimum. This again illustrates the necessity for analyzing costs for specific operations in terms of overall job costs. Several operations in the narrow trench cost more than in wider trenches, as can be seen on the partial tabulation *(Case 4)*. Economics in other operations such as backfilling and, in particular, in the cost of permanent paving repair far outweigh these increases, however.

In view of the savings possible through reduced pavement breaking and repair charges resulting from narrower trenches, the next logical step to consider is eliminating the main trench entirely. Where street resurfacing costs are an important element, boring the main excavation from relatively short slots has contributed not only to significant cost reductions but also to improved public relations as well, since spoil piles and hence traffic interference are reduced to a minimum.

A variation of this same technique can be used profitably in many cases in replacing a large-diameter main with a smaller one by inserting the new main in the old. The reduction in paving and excavating costs frequently makes this shoving operation very economical, even if temporary main bypasses have to be installed to maintain service to customers.



Among recent developments offering relief in breaking through a heavy layer of case-hardened concrete paving is the concrete saw, which in some instances is used as a basis for reducing the amount of pavement broken back along the edge of a trench.

The bonanza: Crew organization

One of the more fertile fields for cost reduction lies in the realistic sizing of distribution field crews. Too frequently, the number of men on a particular crew is determined by manpower requirements for certain peak operations, or the crew leader gets in the habit of retaining more men than are required simply because it simplifies handling absences or because it adds to his prestige to have a large gang working for him. The fact of the matter is that it takes a crackerjack crew leader to keep all men on a large crew productively occupied on most distribution operations. They may all be busy, but chances are there's a certain amount of "make work" being performed some time during the course of the job.

Here's an effective way of analyzing crew sizing. Set up a tabulation sheet, with a vertical column for each man on the crew such as is shown in *Case 5*. Mark off a convenient time scale and record what each man is doing all the time—including the time he is standing by for another operation to be completed or for another man to assist him. Mark off these standby intervals in bright red pencil (see circled portions) to highlight the amount of delay incurred as a result of the difficulties involved in keeping the work of a large crew integrated and balanced.

Case 6 shows what we found, for example, in making this sort of analysis of the work distribution for a four-man and a three-man service crew doing the same job. As you can see, as a result of reduced standby time and better work conditions, the three-man crew not only did the job with substantially fewer manhours, but also in slightly less total elapsed time on the job.

Standard service crew

A similar review of the work of other large types of crews led us to the conclusion that a standard service and maintenance crew should consist of three men—a working crew leader who does the welding, a crewman qualified to do pipefitting and to operating tapping units and similar pressure control equipment, and a helper. This resulted in an overall reduction in crew cost per hour of 40 to 50% from the old standard crew of from five to eight men.

Even with the smaller crew there is a certain amount of unavoidable standby time resulting from operations that cannot be completely coordinated. Furthermore, crews must be sized in terms of a day's work, not for just one job. It may be less expensive to have extra personnel on a crew at certain periods during the day than it would be to incur the additional travel and dispatching costs resulting from assigning only those jobs to a particular crew that it

Time (Min.)	Crew Leader	Welder	Fitter	Helper	Laborer No. 1	Laborer No. 2
0	layout job	Prepare welding equipment	get out traffic signs	Get pneumatic equipment		Light tar pot
2						
4			excavate in yard	break pavement	standby	
6	standby	weld service pipe				
8				standby	shovel broken pavement	
10						

Case 5. Crew-manning analysis sheet.

can perform with an absolute minimum of standby.

And, of course, a proper cost balance must be maintained between manpower utilization and equipment utilization. Conceivably just about any distribution job could be done by one man—with no standby time. Elimination of standby in this manner, however, would increase the elapsed time on the job and consequently the length of time equipment is tied up. The resulting increased equipment charges would unquestionably overbalance whatever savings in labor costs might be obtained. There are other circumstances in which a certain amount of standby time is warranted. For example, a rush new business job or an emergency repair may justify the use of a larger crew, which can complete the work in a shorter time—although with more man hours required.

Basic philosophy

While discussing crew operations it might be well to digress for a moment to re-emphasize the basic philosophy on which this cost reduction program is based. In the first article, we defined the objective of the program as a long range, continuing measure to get the most for every dollar spent on distribution activities. Unfortunately, such a program and the work measurement and time study techniques it employs are too frequently looked upon as short term "speed up" campaigns, aimed at getting employees to work at an unreasonable pace. Nothing could be further from the truth.

The objective of these activities is completely positive: To make sure that only necessary operations are performed; that they are being performed with the best known method—i.e., the easiest one; that suitable tools and equipment are available; and that the size and composition of the crew reflects the volume and variety of work assigned. Proper sizing of a crew to reduce unnecessary standby is not a speed-up measure; it has nothing whatsoever to do with the pace of the crew. As a matter of fact, the general reaction of employees to more realistic crew sizing standards is very favorable since they eliminate the demoralizing and frustrating "make work" chores performed simply to fill in gaps of standby time occasioned by over-manned crews.

Summary

We have shown examples of how distribution costs can be reduced significantly as a result of critical appraisals of tools and equipment, safety practices, job methods, and crew organization. Admittedly each of these improvements could have been achieved without the operation of a cost reduction program. The existence of such a comprehensive program, however, increases the likelihood that every possible cost reduction opportunity is thoroughly explored. Consider *Case 2,* for example: How likely do you think it would be that the reduction in excavating costs possible through proper cleaning of a shovel would receive any attention in the press of normal day-to-day operations?

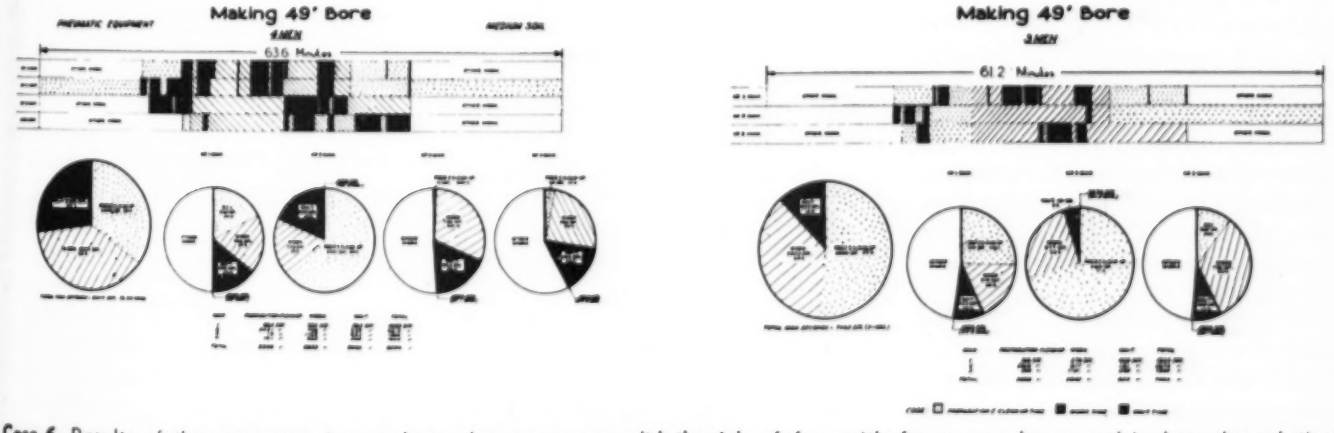
Publicizes improvements

Furthermore, the operation of a cost reduction program publicizes the improvements developed by one employee or district, that have potential throughout the department. A fitter's tray, for example, designed by one employee to reduce his leg work by providing space for all tools and fittings is made available to all fitters faced with the same problem.

And finally, the follow-up activities of any well-formulated cost reduction program assure that potential benefits of improved operations are actually being obtained.

●

In the next article, we will discuss some of the applications of information developed in a cost reduction program in other long range activities designed to focus attention on productive performance and cost reduction opportunities on a continuing and routine basis.



Case 6. Results of the crew-manning analysis: three-man crew did the job of four with fewer man-hours and in less elapsed time on the job.

East Ohio trains dealers' servicemen

By GEORGE Z. GRISWOLD

Students at work on thermostats mounted on panels in a classroom.

THE East Ohio Gas Co., Cleveland, a pioneer in training courses for customer service men, is demonstrating that progressive gas utilities can derive extra benefits from a related activity—free training for servicemen of appliance dealers and contractors.

East Ohio has been sending its own servicemen to school since 1939, when automatic controls began broadening the usefulness and versatility of gas appliances, and newly designed gas furnaces were coming into their own. The growing complexity of domestic gas equipment led East Ohio officials to realize that greater competence was going to be essential for its servicemen. If the company was to enjoy its full potential of growth, it needed confident, satisfied customers who required a minimum of repair work.

Outsiders enthusiastic

The comprehensive employee service training program that evolved from this thinking is now the framework for special courses attended by representatives of gas appliance dealers, contractors, and service shops. These outside people have enthusiastically seized the opportunity to receive complete, up-to-date information and training which they probably could not get anywhere else.

In turn, the company is fully aware that it has a big stake in the skill of these independent service experts. They are key men from both the broad standpoint of public acceptance of gas-burning appliances and the more direct effect on the number of trouble calls the company must handle.

East Ohio answers all trouble calls from customers. But its services are limited to checking, adjusting and restarting out-of-order equipment. It does not stockpile furnace or appliance parts, nor does it directly sell any appliances, although it actively promotes the sale of them. Independent servicemen install all new gas equipment in East Ohio's territory. Hence, good work by them is vital to the reputation of East Ohio and of gas appliances, and it is closely related to the number of service calls the company will have to make later on.

First organized program

Long before East Ohio set up a formal customer service training program, it supplied service information on an informal basis to dealers who occasionally ran up against tough problems. But the first organized training of outside servicemen occurred in 1941 and 1942. A group of plumbers in Cleveland asked the company to give them essentially the same training in water heater service work that East Ohio was then giving its own men. The company agreed. In those first two years, about 30 plumbers went to "school" for six nights, three hours a night.

During the war the training program, for both employees and outside men, was temporarily interrupted. The employees program picked up again in 1946. In 1949 the master plumbers of Canton, Ohio, suggested a course for them similar to that previously given the Cleveland men. Each year since, 50 Canton men have taken instruction.

The training for outside people branched out further in 1950, when the northeastern Ohio members of the National Warm Air Heating and Air Conditioning Assn. asked for instruction in the care and installation of gas furnaces. From V-J Day to 1950, installation of new gas heating facilities in East Ohio's territory had been severely restricted by the Public Utilities Commission of Ohio because of the overwhelming demand for gas. But, as East Ohio's expansion program began to bring system capacity closer to demand, the PUCO permitted the company to take on a greater number of heating installations. The members of the Warm Air Heating Assn. recognized a vast new opportunity. They knew that their sales of new furnaces would probably go up if they also offered competent service work.. They felt their men were well qualified on installation, but that they could use further instruction on service problems.

Intensive heating course

Since 1950 more than 125 furnace men have been given training by East Ohio, in batches of about a dozen at a time. The courses for them are held whenever enough men are available or when new developments in equipment point to a need for special instruction. The heating course is a intensive one, spread over two weeks of five days each, eight hours a day. In 1951, a group of

40 furnace dealers themselves attended a six-evening course, covering the most important phases of the training given their servicemen.

Two years old

Instruction for servicemen of gas range dealers began about two years ago. A total of about 50 men attended a series of evening classes, once a week for 10 weeks. Since that initial group, range instruction has been given only on a spot basis, to about six or eight men at a time.

Recently dealers in East Ohio's territory have been discussing sending men in for training on clothes dryers,

An instructor is putting a Janitrol out of order, preliminary to students' practicing fixing it.

and it is expected that soon classes will be organized to cover this latest field of service.

East Ohio's training classes, for both its own employees and for dealer servicemen, are held in specially equipped class rooms on the second floor of the company's modern Number Two Works. The school annually attracts many visitors from other gas companies around the nation.

Training program staff

Bernard Burke, a former customer serviceman himself, is in direct charge of the service training program. He reports to the superintendent of the Cleveland operating division, and also works closely with Charles L. Scott, one of the directors of employee training. Until recently, Mr. Burke divided training duties with John J. Kelley, who has now been transferred to other duties. Under a new plan, much of the actual instruction will be handled henceforth by a customer service supervisor shifted temporarily from field work, and by an unusually promising serviceman who is considered to have potential supervisor ability.

These latter two posts on the staff represent a brand-new idea, in operation only a few months. If the plan works out, the company intends to rotate supervisors and above-average servicemen in the teaching jobs. The idea seems to have two basic merits: (1) a supervisor will do his regular work in the field better if he has had training and experience as a formal instructor, and (2) the men being trained will benefit from the up-to-date know-how of instructors fresh from the job.

"Learning by doing"

Naturally, "learning by doing" is the fundamental approach of the training program, but the time in the classes is about equally divided between discussions and theory and actual working on problems. The independent servicemen get essentially the same information given East Ohio's own employees.

The courses cover everything about a particular appliance that a serviceman needs to know. Some specific subjects include the fundamental properties and utilization of natural gas; basic adjustments for ranges, water heaters and dryers; electric wiring circuits; types of controls and control settings; principles of operation and design of various types of heating systems; light-up procedure for different appliances, and a review of the newest developments in appliances.

Ample quarters

The school area embraces a spacious conference room where charts, graphs and films are shown; another room outfitted with the latest in ranges and water heaters, some partially disassembled and others completely installed and in operating order; a third room with dryers, refrigerators, commercial ranges, and unit heaters, and a fourth room with furnaces and heating equipment. The "laboratory" rooms are complete with desks and blackboards.

Mr. Burke asks the students to approach the panels—and later the complete appliance under study—just as if they were on a regular trouble call. They are discouraged from immediately taking the equipment apart. The instructors first put the appliance out of kilter. Then they act the part of a typical householder and explain the trouble in the random, uninformed manner of a distressed customer. The student's job is to analyze the situation and to figure out in advance, from the "symptoms," where the trouble probably lies. Only after this thorough original analysis does the serviceman start using tools to determine if he has things figured properly.

The cost of giving training to dealer

Bernard Burke, chief instructor (standing), watches as a student works with coils and wires.

servicemen is not easy to determine because it's buried in the cost of the employee training program. The company trains its own customer servicemen the year around, whether or not dealer representatives come in. If no outside people were instructed, the total cost would probably be little less, since the company would simply use the time and facilities for its own employees.

No charge for independents

No charge is made for the training of independent servicemen. Their employers foot the bill for any personal expenses incidental to their attending instruction sessions.

Workmen's compensation . . .

and the penalty for serious and wilful misconduct

By **MILFORD SPRINGER, General Counsel** • Southern Counties Gas Co., Co., Los Angeles

Although all the cases cited here are from reports of the California courts, nonetheless the legal concept of serious and wilful misconduct is recognized in workmen's compensation statutes in virtually every state in the union.

HUMAN suffering and monetary loss are involved usually in each industrial accident. Compensation for persons injured in the course of their employment is industry's humanitarian practice of the Golden Rule. The obligations on employers in California to pay compensation to any workman injured in the course of duty, regardless of the injured one's negligence, are sufficiently costly to make diligent efforts to prevent accidents a real economy. The California Workmen's Compensation law ignores entirely the concept of negligence of the employee, and instead the cost of industrial injuries is treated as part of the cost of doing business, to be assumed by the industry.[1]

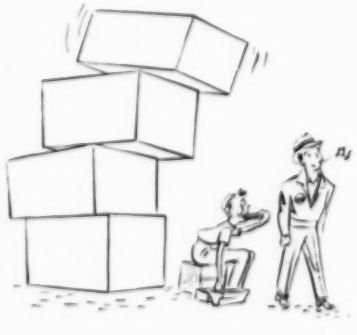
To encourage the employer to be interested in the safety of his employees, the labor code imposes extra liabilities upon the employer who is knowingly indifferent to the safety of his employees. The actions of the safety engineer, the superintendent and the foreman, as agents of the employer, become especially important in the functioning of the Workmen's Compensation law.

Misconduct of employer

While the ordinary hazards of industry will produce injuries to persons although everyone concerned is showing good faith in his efforts to prevent accidents, it is recognized that, as human beings, employers occasionally will show such disregard for safety that industry should pay for that wilful indifference. This state of mind is punished, and it is called "serious and wilful misconduct."

Where the injury or death of an employee results from the serious and wilful misconduct of the employer, or his managing representative, the amount of compensation awarded is increased one-half, with a limit of $3750.[2]

Serious and wilful misconduct defined. The labor code does not make the employer an insurer of the safety of his employees, and it does not authorize the additional penalty award upon a showing of gross negligence. This penalty cannot be insured against, and the award of increased benefits must be supported by evidence that the employee was injured by the serious and wilful misconduct of the employer.[3] In a recent case in which two men were killed and two injured by the collapse of heavy, large, prefabricated parts of a wooden building, caused by inadequate guying and bracing plus wind, the California Supreme Court stated the minimum factual elements that must be proved to constitute serious and wilful misconduct. No California safety order was involved. The court described the difference between negligence and wilful misconduct by stating that negligence is an unintentional wrong, a failure to exercise the care of a reasonable man to protect others from harm, while wilful misconduct involves intentional, or wanton conduct in doing or omitting acts with knowledge that danger is likely to result. The court emphasized that serious and wilful misconduct implies at least an intentional doing of something with knowledge that serious injury is a *probable* result, or an intentional act with knowing, wanton and reckless disregard of its *possible* consequences.[4] The court annulled the penalty awards of additional compensation by the Industrial Accident Commission because (1) the findings of fact only determined that the general superintendent was guilty of negligence, and (2) the commission erroneously attempted to make the employer an insurer of employee safety by imposing the duty to prevent the collapse of the building.



Persons whose acts bind the employer. The law specifies various managing representatives whose conduct or knowledge of dangers will bind the employer.[5] A general superintendent on a construction job is such an agent of the employer.[6] Several recent cases hold that foremen are managing officers, within the meaning of the labor code, and their acts make the employer responsible for the injury to employees. The title is not material, nor does it matter that there are others with higher rank in general charge of the work. It is sufficient if the employer has delegated to the employee a general discretionary control over some distinct branch of the business.[7]

Having secured the services of a safety engineer, and having assigned the duty of providing for safety in operations, the employer cannot defend against a claim of serious and wilful misconduct on the grounds that he did not personally know about either the violated safety order or the hazardous conditions of work. The duty of providing safety in work and in places of employment is imposed upon the employer by sections 6400 and 6401 of the Labor Code. The knowledge, both

This article is adapted from a talk presented at the PCGA accident prevention conference in San Francisco on March 10.

of safety requirements and operating conditions, that should be possessed by the safety engineer is imputed to the employer. Since the employer is responsible and is chargeable with knowledge of safety statutes and orders, it is necessary for the employer's protection that the safety engineer be in a position to make certain that the safety requirements are met, and that safety devices are used in routine operations. The superintendent, foreman, and the safety engineer are important members of the safety team. The safety engineer is in an advisory or staff capacity in most utilities.

The cases involving serious and wilful misconduct of the employer, which are applicable to a utility having a safety engineer, fall into two groups: (1) where the injured employee was permitted to work under dangerous conditions which should have been guarded against; and (2) where an employer has violated a specific statute or safety order of the commission, which resulted in injury to an employee. Where the violated safety law was one for the protection of the workman against a particular hazard and the injury incurred was in connection with this hazard, the penalty against employers will be imposed.[8]

Unsafe working conditions. An employer's failure to guard a revolving saw, which resulted in his employee's loss of thumb and fingers, constitutes serious and wilful misconduct.[9]

An employer was guilty of serious and wilful misconduct when an employee's eye was injured by a rivetset that was ejected from a rivet gun. The employees' supervisor had failed to tell them to use a rubber band as a substitute for a safety device which would have prevented the accident, and the chief engineer had failed to do a number of things that might be considered "reasonably necessary to protect" the safety of the employees, as required by safety laws, and the injured employee had never received a booklet containing the safety rules.[10]

An employer permitted dirt to accumulate on a roof skylight, thereby creating a dangerous condition under which his employees were required to work in the performance of their duties. Without placing a guard rail or warning on the roof used for storage, he acted in reckless disregard of his employees' safety and was guilty of serious and wilful misconduct.[11]

Where steel particles are always in the air, a failure to furnish goggles to a worker, who suffered an eye injury, is serious and wilful misconduct of the employer.[12]

An employer was guilty of serious and wilful misconduct where his foreman, his sole charge, permitted work to be done with an open flame after warning against smoking on account of escaping gas.[13]

Erection and maintenance, by an employer, of scaffolding which is unsafe, and is not provided with railings, constitutes serious and wilful misconduct, rendering the employer liable for increased compensation for the death of an employee falling from the scaffold.[14]

Violation of safety laws and orders. The violation of an express statute or commission safety order designed to protect employees makes an employer with guilty knowledge liable for serious and wilful misconduct. The following cases illustrate this.

The violation by an employer of a safety law, in covering a 13-ft span in the temporary floor of a building under construction with boards that were only 2 in. thick and not otherwise supported or laid tightly together, constitutes serious and wilful misconduct toward the injured worker.[15]

An employer's knowing violation of a safety law by the distribution of drinking water in an open bucket with a common dipper, which caused employee dysentery, constitutes serious and wilful misconduct.[16]

An employer was guilty of serious and wilful misconduct when steel beams on a truck fell, killing the workman who rode the steel. The employer was violating Industrial Accident Commission safety orders against a workman riding on an insecure load, and requiring loads to be secured against displacement.[17]

An employer's failure to guard a vent hole in a ship under construction, in violation of a commission safety order, amounts to serious and wilful misconduct toward the injured worker, rather than mere negligence or inadvertence.[18]

A violation of a safety order of the commission forbidding operation of equipment within 6 ft of high voltage

Compensation legislation pending in several states

Considerable legislation is pending currently in a number of states.

In Indiana, an optional premium discount plan, which affects larger risks, has gone into effect that applies on new and renewal business covering all risks producing a premium exceeding $1000 and would bring about substantial savings to big employers.

In Kentucky, pending bills would substantially increase all benefits now payable under the workmen's compensation act, and would add a new section to provide for death or disability benefits due to occupational diseases.

In Massachusetts, proposals have been made for substantially increased benefits, creation of a monopolistic state fund, assessment of workmen's compensation law administrative costs against insurance companies, and creation of a three-member board of review to handle appeals.

In Michigan, final action is expected on bills to increase weekly compensation benefits in all classes of injuries and to increase coverage to employers of two or more instead of four or more. Another bill has been introduced that would make it impossible to use private carriers to cover compensation risks.

In Mississippi, bills to increase benefits and revise the act are pending, together with a proposal to repeal the law entirely.

In Montana, the State Federation of Labor is campaigning for a proposal to broaden the states' compensation act to include "prominent occupational diseases."

In New Jersey, action is expected on proposals for liberalization of workmen's compensation benefits.

In New York, bills are pending that would increase compensation benefits; would tighten the exclusive remedy provisions of the law; and restore the concept by which awards would be made for occupational loss of hearing only when it has caused loss of wages.

In Oklahoma, a newly adopted 20.6% reduction in rates will probably result in a saving of about $4 million to employers.

In Rhode Island, a bill would create a three-member commission to settle disputed claims for workmen's compensation.

In Virginia, the legislature has just approved a bill increasing maximum workmen's compensation benefits.

lines, causing an employee injury, constituted serious and wilful misconduct where the physical arrangement of the employer's yard for a long period of time was such that violations occurred frequently, and where it could be inferred that such conditions must have been known to the responsible managing agents.[19]

A permanent hand injury resulting from neglect to furnish a guard that was required by a general safety order is serious and wilful misconduct by the employer, even though the failure was attributable to an erroneous interpretation of the order by his superintendent.[20]

The failure of an employer to shore the sides of a trench being dug through unstable soil and subject to displacement by passing traffic is serious and wilful misconduct.[21]

Where an open and defective knife switch on a 440-volt electric line was continued in use contrary to general safety orders, which both the general superintendent of maintenance and the superintendent of the particular plant knew about, it constituted serious and wilful misconduct of the employer, resulting in a workman's death.[22]

Misconduct of employee

Misconduct of an employee who is injured in an industrial accident reduces the amount of compensation to which he is entitled. For illustration, an employee is not entitled to any award if the injury is caused by his intoxication or is intentionally self-inflicted.[23]

Where an employee unreasonably refuses to submit to medical or surgical treatment, no award can be made for death or disability to the extent that it is caused by such refusal.[24]

Where the injury is caused by the employee's serious and wilful misconduct, his normal recoverable compensation is reduced one-half, except: (1) where death, or at least 70% disability, results; (2) where the injury is caused by the failure of the employer to comply with any applicable safety law or order; (3) where the injured employee is under 16 years of age.[25]

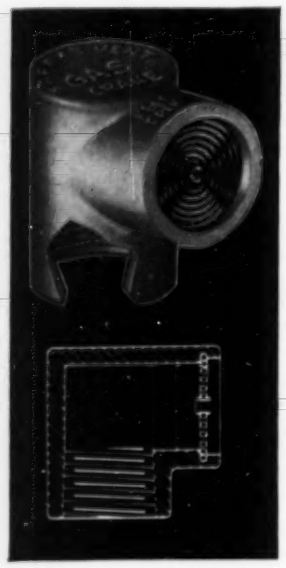
In connection with the misconduct of an employee, wilful misconduct exists in the deliberate violation of a safety order made for the employee's own safety, or for the safety of others, when such orders are enforced by the employer with diligence.[26]

Acts that constitute penalized serious and wilful misconduct. An employee is guilty of serious and wilful misconduct when he deliberately violates safety orders, such as removing a safety guard that has been placed on a machine for his protection and, as a result, is injured.[27]

An injured machinist's helper was guilty of wilful misconduct when he intentionally neglected to obtain and use safety goggles, contrary to rules which were made for his protection.[28]

To establish an employee's wilful misconduct you must prove a situation that exceeds the limits of gross negligence. The evidence must show either a wanton disregard of possible danger that amounts to foolhardiness, or an obstinate opposition to rules made for the safety of employees and enforced.[29]

Where an employee is instructed to disconnect a belt from a power shaft in order to stop the descent of a die in a manufacturing machine, and is familiar both with the safety regulation and the danger in disobedience, he is guilty of serious and wilful misconduct in attempting to remove an



New CRANE
¾-inch
Safety Vent Elbow
with non-clogging screen

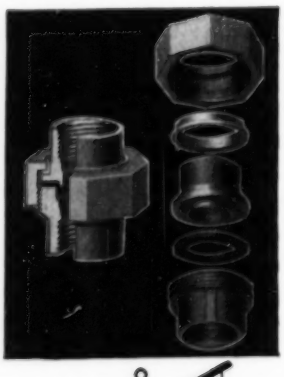
Here's a basic improvement in gas vent elbows. A flexible stainless steel coil spring takes the place of the old bar grate or rigid screen that clogged so easily. In normal, or closed position, the space between the windings of the coil spring is small enough to keep out insects, dirt, etc. But gas pressure from behind easily flexes the spring outward, enlarging the space between coils for full-open venting of gas and the expulsion of foreign matter.

Durable, dependable—die cast of zinc alloy with integrally cast cross bar to prevent the coil spring from being jammed back into the fitting. *Thousands already in service.*

Check your Crane Representative on both these new items!

New
CRANE Insulated Union
Gives Cathodic protection at meters

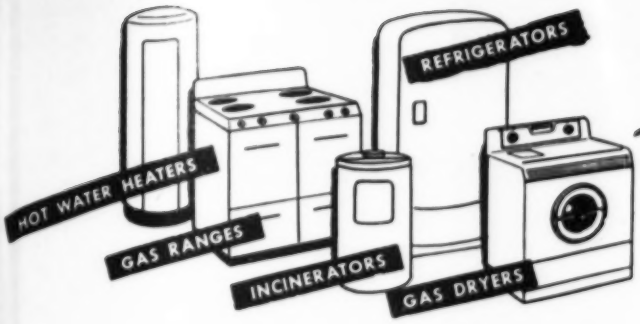
Install this new insulated union at the gas meter for cathodic protection against galvanic corrosion. Special gasket and washer with high dielectric strength effectively break the electric path. Regular ¾-inch size in Crane malleable iron.



CRANE

CRANE CO., *General Offices:* 836 S. Michigan Ave., Chicago 5, Illinois
Branches and Wholesalers Serving All Industrial Areas

VALVES • FITTINGS • PIPE • PLUMBING • HEATING



and now a NEW base-load builder

Greatest NEW GAS APPLIANCE in years!

BENDIX GAS DUOMATIC

washer-dryer all-in-one

it washes . . . then AUTOMATICALLY dries with GAS all in one continuous operation

SELLS GAS not one, but 3 big ways!

1. **WHEN IT WASHES CLOTHES, IT AUTOMATICALLY DRIES THEM WITH GAS!** Assures heavy use of gas for drying through every season.
2. **DUOMATIC OWNERS LAUNDER OFTEN —USE MORE GAS TO HEAT WATER.** It's so simple to do, many wash and dry every day!
3. **DRAMATIC PROOF THAT GAS *IS* THE *AUTOMATIC* FUEL!** For what could be more vividly automatic than a machine that washes *and* dries clothes all in one operation!

BENDIX HOME APPLIANCES AVCO Manufacturing Corp.
Cincinnati 25, Ohio

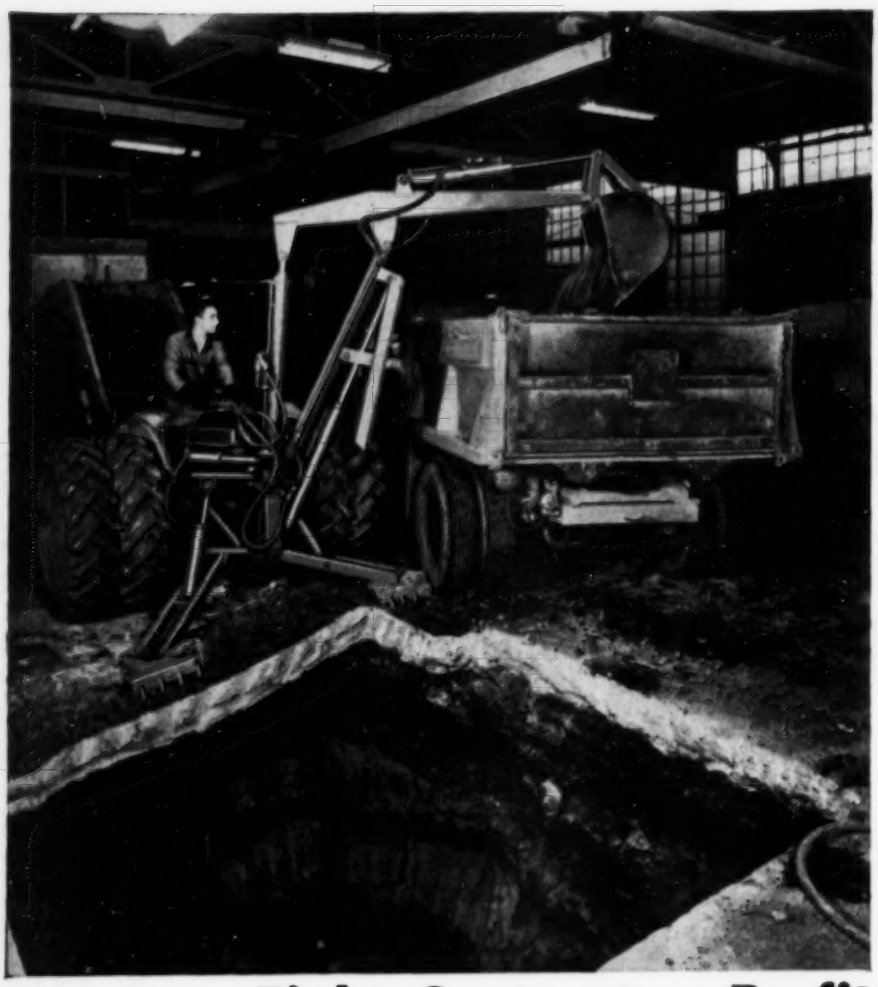
WHAT? You promote a machine that washes?

Why not? If you let folks go buy a separate washer, they may get any kind of dryer to go with it—or none at all.

But those who get the Gas Duomatic have a *gas* dryer built right into it.

By promoting the Gas Duomatic (as a machine that *washes* as well as dries) you're making every washer prospect a prospect for gas drying, too!

Establish GAS as the fuel choice for this newest miracle appliance!
Promote the
BENDIX GAS DUOMATIC!



Get Into Tight Spots at a Profit ...With a Sherman Power Digger!

Here's real proof of the compactness and maneuverability of the Sherman Power Digger! The job: Dig a 6 foot deep machine foundation hole 10 feet square in a working area only 20 feet square, with overhead beams and lights reducing the ceiling limit to less than 10 feet in some spots.

The floor was 8 to 10 inches of concrete, reinforced with ¼ inch steel rod. It was broken up with air tools, then loaded into a dump truck by the digger. Manual loading would have been difficult because of the reinforcing rods, but these presented no problem when loaded mechanically.

Digging and loading took less than four hours, in spite of the limited maneuvering area. Estimated time for hand labor: Three men working about 2½ days!

If you now excavate by hand, or if your heavier power equipment cannot work in tight spots, you'll profit with a Sherman Power Digger. It's compact, flexible, fast, easy to operate. It costs little to buy, less to maintain, quickly pays for itself. For the whole story, write today for Bulletin No. J-13.

Designed, Engineered and Manufactured Jointly by
SHERMAN PRODUCTS, Inc.
Royal Oak, Michigan
WAIN-ROY CORPORATION
Hubbardston, Mass.

Patent No. 2,303,852
Other patents pending
© SHERMAN PRODUCTS INC., 1954

Sherman
PRODUCTS, INC.
ROYAL OAK, MICHIGAN

obstruction from the die without disconnecting the belt.[30]

An employee has been charged with serious and wilful misconduct when he exceeds speed laws, or does reckless driving, while en route to carry out instructions of his employer.[31]

When an employee does an act in a forbidden manner, he is penalized by a reduction in compensation for an injury. A good example is the case in which an employee had the duty of carrying machine parts from a storeroom by hand in the event the regular driver of a truck was not available, and he was expressly forbidden to drive the truck. The employee transported parts with the truck and was injured. The court held that the injury was compensable but the violation of instructions justified the reduction of the award by 50%, for serious and wilful misconduct.[32]

Acts which are not serious and wilful misconduct. Where an employee put his hand inside a pipe while warming himself and was injured from the revolving fan in the pipe, it was not wilful misconduct, because the employer directed the employees to warm themselves and there was no way of knowing that doing it in this manner was dangerous.[33]

An employee's use of a rope instead of an elevator to descend from the roof of a building is not misconduct where injury is caused by the breaking of the rope because of a hidden defect.[34]

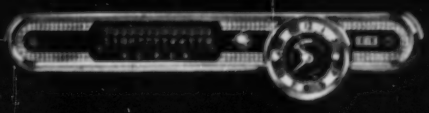
Where an employer makes a rule but does not enforce it, and it is disregarded customarily both by workmen and foremen, the breach of the rule does not constitute serious and wilful misconduct of the employee.[35]

Disobeying an order to wear canvas gloves provided to protect against burning by hot tar while tending a tar kettle does not constitute serious and wilful misconduct on the part of the employee who, at the time of his injury, was bare-handed and carrying a sack of rock on the roof. He fell into a bucket of hot tar, suffering severe burns on his hands.[36]

Design for Selling ··· Profitably

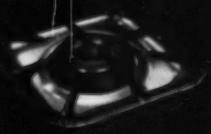
ROPER

Sell this advantage!



Sell this advantage!

Sell this advantage!



Sell this advantage!

Ask, too, About the Fast-Selling, Profit-Making New ROPER DRY-AIRE Gas Clothes Dryer

GEO. D. ROPER CORPORATION
Rockford, Illinois

Sales Representatives in Principal Distribution Centers

G3

Tell me more about what ROPER can do for me. Is the ROPER franchise available in my community?

Company Name.....

Individual's Name.....

Street Address.....

City.....State.....

An employee injured while throwing off a moving belt from a machine that he had been denied permission to touch, is not guilty of serious and wilful misconduct where he had misunderstood the orders of his superior.[37]

An employee who could have escaped to safety upon the warning of a danger, but who remained to rescue a fellow workman in peril and lost his life, is not guilty of misconduct even though he deliberately exposed himself to the danger of death.[38]

Where an employee's eye is injured because of inadvertent omission to wear goggles in compliance with a safety regulation, it is not serious and wilful misconduct when he is rushing at the foreman's direction, and the employee had never failed before to comply with the safety rules.[39]

The importance of safety discipline

We all know the effectiveness of applied discipline. Lack of plant discipline is the real cause of many industrial accidents. By permitting, through acquiescence of the foreman, practices or operations inconsistent with safety,

employers often defeat the purpose of creating a physically safe plant supposedly governed by wise safety rules.

The law tests the liability of the employer for added compensation to be paid to an employee injured because of serious and wilful misconduct of the employer, not by the formal safety rules but by the employer's actual method of operation. The employer must provide both safe equipment and maintenance of that equipment in a safe condition during all its operating time. Employee resistance and ignorance requires vigorous education. The labor code can be used intelligently to foster an employer's safety educational program.

References

1. Workmen's Compensation, Campbell, Vol. 1, pp. 10-11; Labor Code, Section 3600.
2. Labor Code, Section 4553.
3. *Mercer-Fraser Co.* v. *Industrial Accident Com.* (1953) 40 C. 2d 102, 108.
4. *Mercer-Fraser Co.* v. *Industrial Accident Com.* (1953) 40 C. 2d, 102, 116-118, 124-5. See also *Hawaiian Pineapple Co.* v. *Industrial Accident Com.* (1953) 40 C. 2d, 656, 662-3.
5. Labor Code, Section 4553.
6. *Bethlehem Steel Co.* v. *Industrial Accident Com.* (1944) 23 C. 2d 659, 668.
7. *Cal. Ship Building Corp.* v. *Industrial Accident Com.* (1946) 27 C. 2d 536, 540. *Henry J. Kaiser Co.* v. *Industrial Accident Com.* (1947) 81 CA 2d 818, 823.
8. *Parkhurst* v. *Industrial Accident Com.* (1942) 20 C. 2d 826, 830.
9. *Pacific Emp. Ins. Co.* v. *Industrial Accident Com.* (1930) 209 Cal. 412.
10. *Vega Aircraft Corp.* v. *Industrial Accident Com.* (1947) 77 CA 2d 786, 787.
11. *Hatheway* v. *Industrial Accident Com.* (1939), 13 C. 2d 377, 378.
12. *Courtouis* v. *McKlintic-Marshall Co.* (1929), 15 IAC 61, 62.
13. *Pena.* v. *Mlagenovich* (1932), 18 IAC 1.
14. *Davis* v. *Craig Ship Building Co.* (1918), 3 IAC 118.
15. *Hoffman* v. *Department of Industrial Relations* (1930), 209 Cal. 383, 386.
16. *Parkhurst* v. *Industrial Accident Com.* (1942), 20 C. 2d 826, 828.
17. *Bethlehem Steel Co.* v. *Industrial Accident Com.* (1944), 23 C. 2d 659, 661.
18. *California Ship Building Corp.* v. *Industrial Accident Com.* (1946), 27 C. 2d 536, 540.
19. *California Ship Building Corp.* v. *Industrial Accident Com.* (1947), 31 C. 2d 270, 271.
20. *Girard* v. *Pacific Fruit Express Co.* (1924), 11 IAC 181.
21. *Linton* v. *Eureka* (1928), 15 IAC 30.
22. *Hemkamp* v. *Union Rock Co.* (1926), 13 IAC 114, 115.
23. Labor Code, Section 3600. *Pacific Freight Lines* v. *Industrial Accident Com.* (1945), 26 C. 2d 234, 240.
24. Labor Code, Section 4056. *Danziger* v. *Industrial Accident Com.* (1930), 109 Cal. App. 71, 74.
25. Labor Code, Section 4551. The words "serious and wilful misconduct" are given the same meaning for employees and employers. *Hawaiian Pineapple Co.* v. *Industrial Accident Com.* (1953), 40 C. 2d 656, 664.
26. *Rietzke* v. *Burnett & Sons* (1928), 15 IAC 63.
27. *Bay Shore Laundry Co.* v. *Industrial Accident Com.* (1918), 36 Cal. App. 547, 551.
28. *McAdoo* v. *Industrial Accident Com.* (1919), 40 Cal. App. 570, 573.
29. *Walker* v. *Arctic Ice Machine Co.* (1933), 19 IAC 48.
30. *Deak* v. *American Can Co.* (1917), 4 IAC 18, 19.
31. *Smith* v. *Broadway Productions* (1934), 20 IAC 6, 7. *Kinsell* v. *Union Indemnity Co.* (1930), 17 IAC 18.
32. *Auto Lite Corp.* v. *Industrial Accident Com.* (1947), 77 CA 2d 629, 630-1.
33. *Mercado* v. *Joannes Brothers Co.* (1919), 6 IAC 259, 260.
34. *Brooks* v. *Lindgren Construction Co.* (1920), 7 IAC 131.
35. *Iede* v. *Panama Mail Steamship Co.* (1925), 12 IAC 245.
36. *West* v. *Haynes* (1925), 12 IAC 234.
37. *Cerka* v. *Continental Casualty Co.* (1925), 12 IAC 42.
38. *Mihaica* v. *Mlagenovich* (1914), 1 IAC (Part II), 174, 175.
39. *California Packing Corp.* v. *Larsen* (1919), 6 IAC 41.

McWANE-PACIFIC SUPER DeLAVAUD

MECHANICAL JOINT CAST IRON PIPE

Mechanical Joint has rapidly become the leading type joint for cast iron pipe for water or gas. A McWane-Pacific Boltite mechanical joint pipe line can be laid fast by untrained workmen, using only a ratchet wrench to make the joints. No lead pot, no calking tools.

The Mechanical joint is designed on the stuffing box principle—a thick rubber-compound gasket, triangular in cross section, being compressed by a bolted gland or follower ring. The joint is bottle tight, but flexible to allow settlement, expansion or contraction of the pipe line. Mechanical joints are interchangeable with fittings, valves, hydrants and pipe made by all leading manufacturers.

For complete information, wire or write McWANE CAST IRON PIPE COMPANY, Birmingham, Alabama, or PACIFIC STATES CAST IRON PIPE COMPANY, Provo, Utah. (Sales Offices in principal cities.)

McWANE PACIFIC PIPE Lasts for Centuries

is something
ALWAYS
missing?
(to cut your profit)

...then switch to the one line that meets every selling need

* **EXAMPLE No. 3:** Your own experience will tell you that it's usually easier to sell an established name. This is a premium advantage you enjoy when you offer Bryant. First, because Bryant—in 45 years in business—has earned a reputation for quality in millions of American homes. Second, because Bryant—over this same span of years—has consistently advertised nationally and locally to support *your* selling efforts—*longer than any other manufacturer of automatic heating, air conditioning and water heating equipment!*

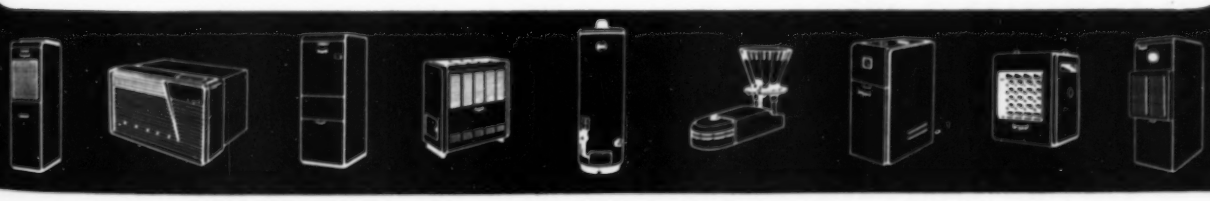
Your nearby Bryant Distributor has complete details. It will pay you to call him today.

bryant®

HEATING AIR CONDITIONING WATER HEATING

1. The most complete line in the industry
2. Quality products—Competitively priced
* 3. Established name—Good customer acceptance
4. Broad, attractive profit margins
5. Local Distributor warehousing and service
6. Factory district representatives and traveling sales training and service teams

Bryant Heater Div., Affiliated Gas Equipment, Inc., 17825 St. Clair Ave., Cleveland 10, Ohio



HAVE YOU BEEN "Ostrich-ized"?

Are you facing the facts? Do you take things for granted or just brush them off like this . . .

- "We have no leakage problem" . . . *Hundreds of Annual Heath Surveys give the answer.*
- "Our own forces take care of it very satisfactorily" . . . *Results of Heath Audits prove there's a difference.*
- "We have so much new construction, we have no time for such work" . . . *It costs less to remove the "Hazard" than to have a bad accident.*
- "We know where most of the leaks are, and an outside survey would only serve to pile up more leaks" . . . *A Heath Survey classifies leaks to set up an economical repair plan.*
- "And other arguments which refuse to face the facts" . . . *Trouble is the partner of "gas on the loose".*

We expect you may agree with us that all this is not "heads-up" thinking. Gas Leakage is a serious problem, and rates a careful accounting.

HAVE HEATH "AUDIT" YOUR GAS LEAKAGE SITUATION and GIVE YOU a COMPLETE REPORT

For complete information, Today WRITE, WIRE or PHONE...

HEATH

SURVEY CONSULTANTS, INC.

572 Washington Street
Wellesley 81, Mass.

Midwest Office — Richmond, Mich.

YOU CAN'T SELL GAS THAT LEAKED OUT

Utilities' appliance labs—

Their place in a strong AGA requirements program

By **EDWIN L. HALL, Director** • AGA Laboratories, Cleveland

MANY of the larger utilities in the country have been strong and active supporters of the AGA approval requirements program. Their support has induced them to maintain laboratories for checking appliance performance and for other reasons.

A recent survey of 17 of these companies representing some 7 million customers included most, if not all, of such companies. Primarily most of these check appliances for compliance with American Standards, and to obtain additional information such as their operation under prevailing local conditions such as peak load gases, etc. More than one half of the companies, representing more than one half of the meters, check appliances for compliance with additional requirements over and above those required for AGA approval.

Other purposes served

These utility laboratories serve many other purposes. They examine appliances to determine what servicing problems may develop and whether the appliances meet local standards for performance and serviceability. They examine them to determine that all reasonable safety precautions had been included in their development. They examine them to determine definite reasons for an excessive number of complaints on a specific appliance, and in connection with their service schools for instruction purposes. Such appliances are compared with other gas appliances and with competitive equipment.

Most of these laboratories have found ways and means to cooperate with the AGA approval requirements subcommittee in developing changes and additions to approval requirements. Some of them have cooperated with government agencies or have criticized government specifications in drafting proposed ordinances regulating the sale and installation of gas appliances. Of course, most of them have been asked to express opinions when incidents occur in which gas or gas appliances are involved with relation to the public. Almost all of these laboratories have furnished the manufacturer with a report of their findings, cooperated with local health, fire and safety authorities, and reported appliances found defective to the AGA Laboratories.

Some of these laboratories have developed those supplemental requirements that fall in the class of "too many laws" and that increase the cost of the appliance to consumers. These additional requirements have been developed for many reasons. Possibly the most important reason is that the originator of the requirement knows that a proposed requirement is good but does not attempt to, or is unable to produce sufficient evidence that will convince the AGA subcommittees that are concerned with the point at hand. In developing requirements it is well to remember that if a requirement is good and is desirable, it will be ultimately accepted when enough facts are available. It must be recognized here that one fact is worth a thousand opinions because opinions will reflect many points of view and will never agree.

Three classes

A review of these additional supplemental requirements has indicated that they usually fall into three classes. The first class comprises those that are necessary because of local conditions. Such conditions may be high altitude, high sulfur content, local ordinances, or a variety of causes. Many of these conditions cannot be corrected or changed. In such cases neither other utilities nor manufacturers of gas appliances have any dispute about the necessity for such special requirements.

The second class of special requirements comprise those that should be

This article has been adapted from a talk presented at the Mid-West Gas Association meeting, March 15-17.

Select the control that helps you sell—

Robertshaw® MODEL BJ OVEN HEAT CONTROL

Millions of Model BJ Controls in service today have earned for themselves a nation-wide reputation for high quality and dependable performance. These qualities have won the confidence of dealers and range manufacturers alike.

And you get more than high quality and dependable performance! You get national acceptance and recognition from millions of American homemakers who have learned from experience and from consistent national advertising to prefer . . . *and to buy* . . . gas ranges equipped with Robertshaw BJ Controls.

Select the best-known name in oven heat controls . . . and make *your* gas ranges easier to sell.

Increase your sales with Mr. Controls →

Robertshaw-Fulton CONTROLS COMPANY

ROBERTSHAW THERMOSTAT DIVISION, Youngwood, Pennsylvania

documented with facts, presented to the proper AGA approval requirements subcommittees, and included in national standards. A precedent for this second group was set by the handling of supplementary utility requirements for gas water heaters. Previous experience with supplementary requirements for central heating appliances had made it very apparent to both utilities and manufacturers that such supplemental requirements led to misunderstandings, a variety of interpretations, and increased costs to the utilities, the manufacturers, and to the customers. In the case of water heaters, all necessary supplemental requirements were adopted in national standards following requirements committee action and supplementary standards then ceased to exist. No such complete progress has been made with the SUR requirements for central heating appliances, but most of such requirements have been adopted in the national standards so that the difference becomes less and less each year.

The third class of special company requirements are those that are founded upon whims or prejudices of local personnel. They are the most difficult to deal with because it is so hard to assemble the necessary facts on either one side or the other. Fortunately, there are not many of them. As clear answers are developed that they are not included in either of the categories of "due to local conditions" or "should be included in AGA requirements," the result is to leave the third group isolated and very apparently unnecessary.

A possible example of such requirements as may develop from an opinion is a requirement of serviceability. At the Laboratories we are frequently accused of lack of field experience, and, of course, that is unfortunately true; we barely keep ahead of the demands from industry for our engineers, let alone have time to give them full experience. But let it be clear that in almost all, if not in every case, the problem of serviceability has been reviewed by the proper subcommittee, and it is the subcommittee's judgment, not the test engineer's, that determines acceptability.

Understanding and support

If the approval program is to continue to serve the industry it must be understood and supported by all interested agencies. Manufacturer representatives of requirements subcommittees are nominated by the Gas Appliance Manufacturers Association. Such nominations are eagerly sought and appointments by the chairman of the approval requirements committee gladly accepted. Utility company representatives are also appointed by the chairman of this committee. A constant need exists for utility representation to fill vacancies as they occur and as new groups are organized.

We find that we cannot always obtain the type of utility representatives that we desire. When we cannot do so, it seems to be due to one of three causes. First, not all company managements appreciate the broadening influence of committee work, and the fact that it is quite difficult for two gas men to get together and not learn something constructive from each other. Second, some gas companies, perhaps many, are understaffed and do not have the flexibility that is needed, or at least they do not think they have people to spare for such activities. Third, some companies exhibit a lack of interest or a lack of knowledge of how the activities of their staff members in this program can help the company, the individual, and the entire industry in furthering our requirements efforts.

PEERLESS
Type "MP"
ODORIZER
UNIT
The Peerless Type "MP" Odorization Unit has been designed to provide a complete odorization setup which is easily installed. This odorizer utilizes the Patented Peerless principle of liquid odorant injection.
LOOK AT THESE ADVANTAGES . . .
• Accurate proportioning of odorant into line.
• Safety tank built in. Cannot flood.
• Leakage is eliminated since all welded piping and packless valves are used.
• It occupies a minimum of space. Only one foundation needed.
• A minimum of piping is required for installation.
• Installation time is reduced.
• Maintaining odorizer is quite simple. Odorizer mechanism easily accessible.
Write for Bulletin 904 & 905
Peerless Type "MP" Odorizers have many more outstanding advantages, all engineered to give you the most accurate odorizer available.
PEERLESS MFG. CO.
PEERLESS MANUFACTURING CO.
P. O. BOX 7193 • DALLAS, TEXAS • DIxon 8431
REPRESENTATIVES IN ALL PRINCIPAL CITIES

TESTS PROVE!

"SERVEL refrigerator is a better load builder than the Gas Range!" ...says C. L. BENN

Gas Refrigerator superiority proved in independent tests conducted by C. L. Benn, Chief Utilization Engineer of Equitable Gas Company, Pittsburgh, Pa.

2 SERVEL ADVANTAGES PROVED!

1 Tests indicated monthly consumption by gas range of 1.233 H.C.F. per range ... and 1.38 H.C.F. for the Servel Refrigerator. Servel maintains and boosts your gas load better than the average gas range!

2 The independent Pittsburgh tests proved the Servel gas refrigerator is more economical in the consumer's home than any other type of refrigerator. Eight-day tests were conducted under closely controlled conditions, using an electric and gas refrigerator of comparable capacity. Fuel costs per month showed electricity at $1.56 and gas at 90¢. This Consumer-Saving is a powerful advantage in selling the appliance that does most for you!

THESE FEATURES SELL SERVEL!

- **Ice "Cubes" Automatically ... no messy ice trays!**
- **10-year warranty ... with no motor to wear out!**
- **3 appliances in 1 ... refrigerator, freezer, ice-maker!**
- **Huge separate freezer ... up to 80 lbs. of frozen foods!**
- **Automatic Defrost ... completely carefree!**
- **Door shelves ... and adjustable interior shelves!**

A complete selection of fully automatic gas water heaters in a range of sizes to fit every need.

TODAY ... CASH-IN ON YOUR SERVEL ADVERTISING-MERCHANDISING PROGRAM! CALL IN YOUR SERVEL DISTRIBUTOR NOW!

Servel

The name to watch for great advances in
REFRIGERATION and AIR CONDITIONING

Servel Inc., Dept. G5, Evansville 20, Indiana • In Canada, Servel (Canada) Ltd., 548 King St., W., Toronto, Ontario

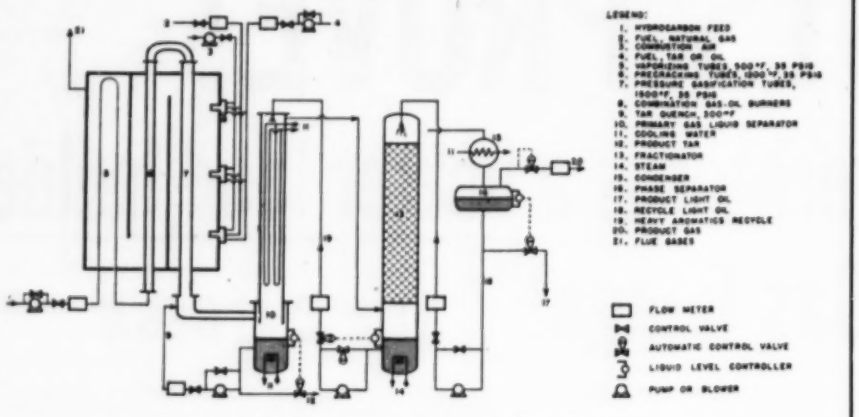


Fig. 1. Pressure gasification pilot plant.

Continuous production of natural gas substitutes by pressure gasification of light hydrocarbons

By E. S. PETTYJOHN
H. R. LINDEN and W. G. BAIR
Institute of Gas Technology
Chicago

ONE of the developments pioneered by the Institute of Gas Technology, and sponsored since 1950 by the East Ohio Gas Co., has been the continuous moderate-pressure gasification of natural gasoline in tube furnaces. The use of gasification pressures above atmospheric results in a considerable increase in the production of gaseous paraffins and corresponding decreases in the production of hydrogen and olefins,[1,2] thereby increasing the substitutability of the product gases for natural gas. Storage costs of natural gasolines are substantially lower than conventional LPG storage costs. Further, tube furnace capacities in high-temperature, vapor-phase cracking operations appear to be nearly proportional to the absolute pressure at constant cracking temperatures where the heat transfer rates are not limited by the firing rates.

GAS digests

Process hydrogen

A pilot plant study of pressure gasification has recently been extended to include the use of process hydrogen. By suitable adjustments of operating conditions it was possible to employ sufficient quantities of feed hydrogen for complete gasification of 26-lb RVP (Reid vapor pressure) natural gasoline while still producing approximately

This article is an abstract of the IGT report on "Continuous Production of Natural Gas Substitutes by Pressure Gasification of Light Hydrocarbons."

R. S. DEAD WEIGHT GAUGE

the practical and accurate method of checking

- **Line pressures.**
- **Rock pressures at wells.**
- **Static pressure on orifice meters.**
- **Gas pressures on pipeline leakage tests.**

This instrument is based on the principle of generation of pressure by application of a known weight to a hydraulic piston of known area. Conversely, an unknown pressure can be measured by balancing its force on a piston of known area with a known weight—the result is extremely accurate pressure readings.

cenco

Cenco . . one dependable source of supply for everything you need in scientific instruments and laboratory supplies. Over 15,000 items . . 14 branch offices and warehouses.

R.S.C. TULSA

REFINERY SUPPLY COMPANY
621 EAST FOURTH STREET ● TULSA 3, OKLAHOMA
2215 McKINNEY AVENUE ● HOUSTON 3, TEXAS

CENTRAL SCIENTIFIC COMPANY
1700 IRVING PARK ROAD ● CHICAGO 13, ILLINOIS
CHICAGO NEWARK BOSTON WASHINGTON DETROIT SAN FRANCISCO
SANTA CLARA LOS ANGELES TORONTO MONTREAL VANCOUVER OTTAWA

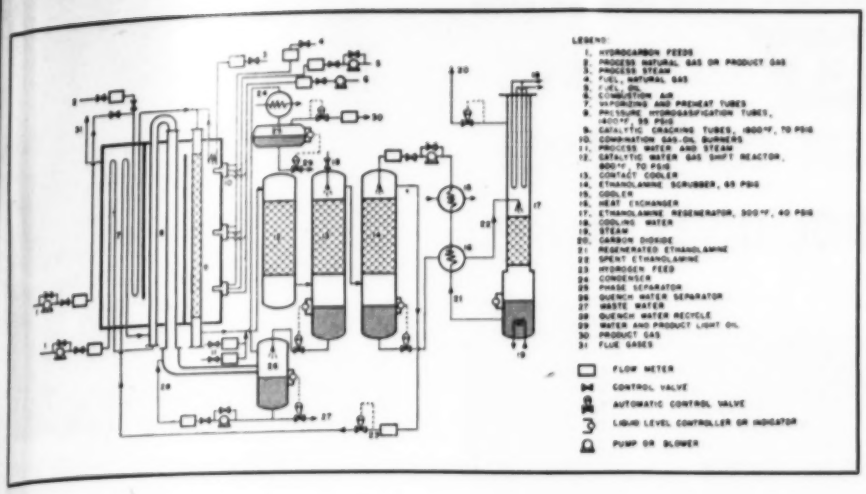


Fig. 2. Pressure hydrogasification pilot plant.

1000 Btu/scf gases, consisting primarily of methane, ethane and hydrogen, and completely substitutable for natural gas.

Tube furnace

Pressure hydrogasification of gasolines, naphthas, and kerosenes in a tube furnace was found to offer a means for the continuous production of high Btu gas completely substitutable or interchangeable for natural gas. Data based on pilot plant operation at 50 to 80 gal./hr and at 60 to 100 scf of feed hydrogen/gal. demonstrated that 930 to 1100 Btu/scf gases consisting primarily of paraffins and hydrogen can be produced without the formation of significant amounts of tar, pitch or coke at 70 psia reaction pressure, 1370° to 1400° F maximum reaction temperature and 3 to 5 seconds residence time after suitable vaporization of the feed hydrocarbon and preheating of the feed hydrocarbon-hydrogen mixture. Complete conversion to gas was obtained with natural gasolines and conversions of over 82 weight percent maintained for the higher molecular weight feeds within the limits of product gas heating values and operating conditions stated. The non-gaseous products from these higher molecular weight feeds were primarily aromatics in the gasoline boiling range.

Produce hydrogen

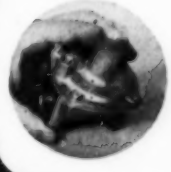
If hydrogen is to be produced by catalytic cracking of natural gas, 7 Mcf of 1000 Btu/scf natural gas substitute could be produced per Mcf of natural gas. If no natural gas is available, it would be necessary to produce the hydrogen from propane, butane or gasoline with attendant reduction of catalytic cracking capacity and a corresponding increase in the investment cost.

Operating efficiency

A combined catalytic cracking and hydrogasification furnace is expected to give optimum operating efficiency since the hydrogasification heat requirements can be met with the waste heat from the high-temperature catalytic cracking step. To investigate the operation of

Here's Maxine mad again. It's the fourth or fifth pan she's ruined. Somehow the gas flame got too high. But it wouldn't go that high yesterday, especially when she wanted it to. Oh yes, just before this occurred, the pilot went out. Burned her fingers getting it going. She's ripe for a sales pitch from a competitive utility.

A GOOD GAS REGULATOR WILL CHANGE THIS



One that will accurately control both pilot flows and the full range input. You'll find the new Maxitrol RV-41 does all this and has many other features to build satisfaction among gas appliance users. It is an appliance sales feature you shouldn't overlook. Find out about it today from **MAXITROL COMPANY, 12200 Beech Road, Detroit 28, Michigan.**

MAXITROL Hallmark of gas heating progress

Tomorrow, as yesterday, you may look to MAXITROL for engineering and product leadership.

Sold on the Pacific Coast by PACIFIC SCIENTIFIC CO., San Francisco, Los Angeles, Seattle, Portland

More for your money!

DAVEY ··· TODAY'S BEST COMPRESSOR AND TOOL INVESTMENTS!

Davey Model 210 Super Chief

From the standpoint of original investment — and reduced operating costs — *you get more for your money with Daveys.*

DAVEY MULTI-PORT VALVES require less engine power and less fuel . . . never carbon or foul . . . assure constant full volume of air, keep tools operating at top efficiency. And, they're only one of many features of today's fine Davey lightweight, heavy-duty compressors in 60-125-160-210-315-500-600 c.f.m. sizes.

DAVEY AIR TOOLS are designed to meet today's needs! They're streamlined . . . perfectly balanced . . . easier to handle . . . hard-hitting with extra high penetrating power. And, because they offer maximum parts interchangeability, they greatly reduce maintenance and repair expense.

For complete details, see your nearest Davey distributor!

Davey Backfill Tampers, 35 and 45 lb. sizes

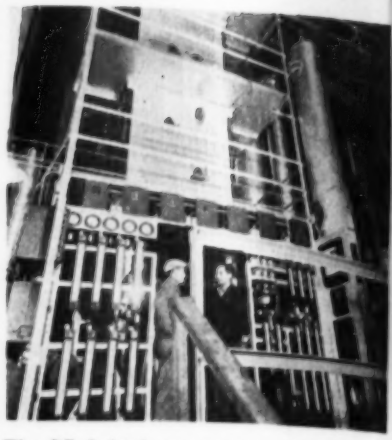
Davey Rock Drills, 4 sizes 28 to 58 lbs.

Davey Paving Breakers 4 sizes—35 to 90 lbs.

A-9254

DAVEY pioneers of "air-cooled air"

DAVEY COMPRESSOR CO.
KENT, OHIO



The 35-ft high pressure gasification unit: Furnace is in center; towers at right are part of product recovery system. Instrument panel is in foreground. The men are standing in a doorway that gives access to the main floor burner installation, tar pots, aromatic recovery system, and feed-weighing scales.

such an integral hydrogasification plant it is planned to convert the present pilot unit *(Fig. 1)* to operate in accordance with the flow sheet of *Fig. 2*. Production of hydrogen at pressures of 70-90 psig will be investigated since this would eliminate the necessity for recompression before introduction into the hydrogasification section. Equipment for conversion of carbon monoxide to hydrogen and carbon dioxide by the catalytic water-gas shift reaction and removal of the carbon dioxide by ethanolamine scrubbing will have to be added to the existing unit.

No cost estimates of the process can be made until the costs of hydrogen production in this integral unit have been established for a variety of feeds. After this economic evaluation has been made, it is expected that a commercial 1 MMcf/hr plant will be designed for peak and winter base load operation on the basis of the operating results obtained for the modified pilot unit.

1. Searight, E. F., and Linden, H. R., "Influence of Operating Variables Upon Substitutability of High Btu Oil Gases," Paper PC-53-10, AGA Production & Chemical Conference, May 1953, "Improvement of Oil Gas Substitutability for Natural Gas by Pressure Gasification," IGT Interim Report, February 1953.
2. Linden, H. R., *Petroleum Processing* 6, 1389-1395 (1951).

NO. 2 IN A "HOW-TO" SERIES

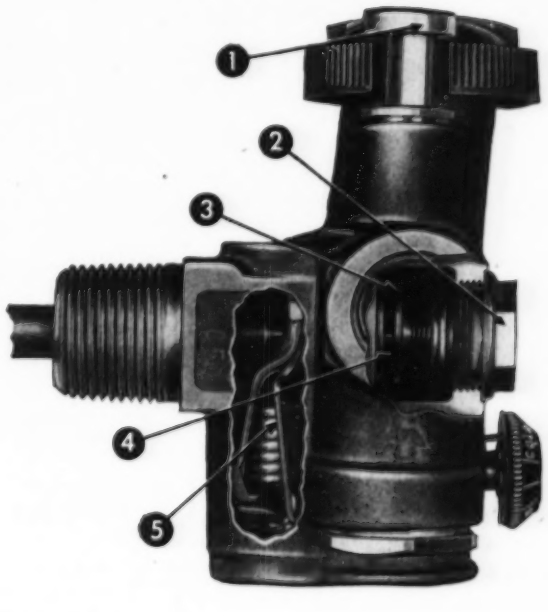
Get these Tankmaster "extras"

AT NO EXTRA COST

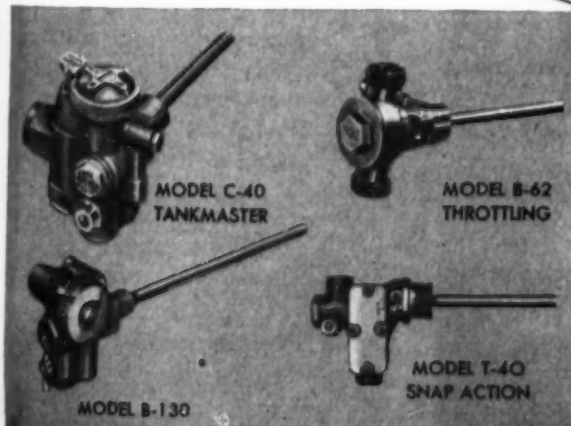
1. **EXTRA SAFE** due to Tankmaster's *exclusive* push-button pilot. 100% safe lighting. Main burner must be turned off before pilot can be lighted.
2. **EXTRA SIMPLE.** Main gas valve easily removable for cleaning should this become necessary. Simply remove valve cap and main valve is at your fingertips. No other valve affords you this simple service feature.
3. **EXTRA LONG LIFE.** Main burner valve and seat of corrosion-resistant material. All Titan controls are factory tested on LP gas to guard against seating leaks.
4. **EXTRA CAPACITY.** Insures an adequate supply of hot water at all times. More than adequate for all normal water heater operations.
5. **EXTRA POSITIVE SNAP ACTION** guarantees 100% accurate opening and closing of main burner valve, with no throttling.

* * *

These are the "extras" you get in Titan Tankmasters without spending a cent more than for ordinary controls. They're completely dependable and practically service-free, even under abnormal operating conditions. If you would like to know more about Titan Tankmasters, or any other of the complete Titan line of controls, write The Titan Valve & Mfg. Co., 9913 Elk Ave., Cleveland 8, Ohio.



TITAN



THE TITAN VALVE & MANUFACTURING CO.
9913 Elk Ave., Cleveland 8, Ohio

☐ I should like to have a Titan representative call.

☐ I should like to receive a copy of the new Titan catalog.

Name_____

Company_____

Title_____

Address_____

City_____ Zone_____ State_____

Thermally Thinking

Continued from page 38

state supplies.

The President noted that the measure preserves the FPC's authority to regulate rates charged for gas moving in interstate commerce up to the time it enters the state in which it is to be wholly consumed. He also noted that the exemption from FPC jurisdiction is operative only if the state exercises and enforces its jurisdiction over rates and services of the distributing gas company.

"I have approved this bill because of my conviction that the interests of the individual citizen will be better protected when they remain under state and local control than when they are regulated or controlled by the federal government," the President stated. "I shall support state regulation of functions and matters which are primarily of local concern whenever possible and when not contrary to the national interest."

The Hinshaw Act presents a "new challenge to the state governments and their regulatory commissions," Mr. Eisenhower declared. "This measure places the responsibility for protection of consumer interest for intrastate matters squarely where it belongs—in the hands of the people of the states and their duly elected or appointed officials. I believe effective and competent discharge of that responsibility will result. If experience should demonstrate that the act creates a larger area of regulation by the states than they will be able to handle effectively . . . I shall promptly recommend that the Congress take . . . remedial action . . ."

Meanwhile, Sen. Robert S. Kerr (D.-Okla.), who is running for re-election but in this instance is fortunate to be from a gas-*producing* state, commended the Hinshaw Act.

"It preserves the integrity of the state," he pointed out, "and was opposed only by those who think the federal government ought to regulate everything." This barb hit a large number of his Democratic compatriots, and some Republicans, who had voted against the Hinshaw Bill.

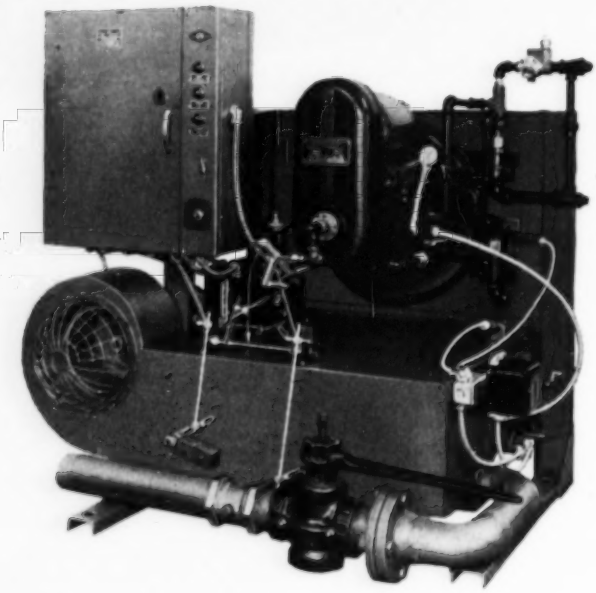
The FPC wasted no time in making a proposed new rule to take care of the new situation under the Hinshaw Act. The agency said that natural gas companies exempted from FPC jurisdiction by the new act will have to make a showing to the FPC that they qualify for such exemption, since, the FPC says, the recent amendment to the Natural Gas Act is not self-executing. Therefore, no company automatically is exempt from the jurisdiction of the FPC because of the Act's existence.

Under the new rule, proposed by FPC, companies seeking exemption must make application to that effect. The commission then will satisfy itself that the rates, service, and facilities of the company actually are subject to regulation by a state commission. If the exemption is granted, the company will be held responsible for calling to the attention of both the state commission and the FPC any future operations which may make such exemption inapplicable.

Final Phillips verdict due

Perhaps the most noted—or widely publicized, at least—case concerning the natural gas industry in the past

WEBSTER ROTONETIC*



DUAL FUEL FIRING BURNER

- Sizes from 75 to 300 horsepower.
- Minimum gas pressure requirements.
- Low installation costs.
- Maximum efficiencies on BOTH gas and oil.
- Minimum base height requirements.
- Utilizes all grades of fuel oil.
- Extremely low noise level.
- Approved electronic combustion safeguard system.
- Simpler changeover than ever before.
- One hundred per cent forced draft.
- Completely assembled, piped, wired and tested.

These and many other outstanding features combine to provide the same dependable high quality performance as the WEBSTER DYNETIC gas burner. Neither fuel must suffer if the WEBSTER ROTONETIC is used. With integral pumps, integral oil preheaters for heavy oils, patented oil burner "flame-shaping" vanes, and full modulating or optional high-low control, the WEBSTER ROTONETIC is designed to provide long lasting customer satisfaction the year around.

It is furnished with a precast refractory front as an integral part of the burner assembly. The installer need only finish the furnace wall on each side and above the burner.

WRITE FOR LITERATURE
Listed by Underwriters' Laboratories, Inc.

*Trademark

The WEBSTER ENGINEERING COMPANY
TULSA, OKLAHOMA
Division of SURFACE COMBUSTION CORPORATION, Toledo, Ohio

decade soon will be decided by the U. S. Supreme Court, if its decision already has not been announced after presstime. This is the controversial Phillips Petroleum case, in which the Supreme Court first seemed to have no interest and then took an extreme interest, particularly when members considered what might be the regulatory result.

Two days of arguments pro and con were required before the high court here to allow the various parties to the case to give their reasons why the FPC should, or should not, be required to regulate independent producers and gatherers of natural gas.

The FPC, through the U. S. Solicitor General, argued that the Congress never intended, under the Natural Gas Act, to regulate producers of natural gas.

The Phillips Petroleum Co., using a former assistant attorney general for its counsel, warned against the consequences of excessive regulation of the natural gas industry, and pointed out that if the court of appeals decision prevailed, such regulation would be inevitable.

Dan Moody, former governor of Texas, representing that state, urged the rights of producing states to regulate their own producers, rather than having the federal government do this.

Attorneys for Kansas City (Mo.), Detroit, Milwaukee, and the Wisconsin Public Service Commission (all in consuming areas, be it noted), argued in favor of compelling the FPC to take jurisdiction.

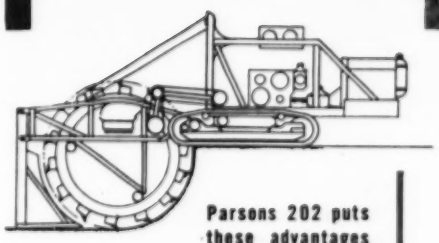
Questions from the various justices seemed to minimize the importance of state conservation regulation as affecting FPC jurisdiction.

Many observers felt that the absence of Supreme Court Justice Robert Jackson lessened the chances of overruling the lower court's verdict, because Jackson in past opinions—notably the Hope Natural Gas case—seemed to be sympathetic to the gas industry's regulatory problems.

Tidelands issue is not dead

A new bill to repeal the "tidelands" law establishing state ownership of submerged oil and gas lands within historic state boundaries has been introduced here by Sen. Paul Douglas (D.-Ill.), joined by 11 other "liberal" Democrats and Sen. Wayne Morse (Ind.-Ore.) and Sen. Alexander Wiley (R.-Wis.).

The law was enacted almost as the



Parsons 202 puts these advantages to work for you:

- 30 digging feeds from 5.9 in. up to 17.5 feet per minute
- 6 speeds on digging wheel up to 11.2 r.p.m.
- 15 cutting widths from 13 to 31 in. wide; depths to 6 feet
- quick-change bucket fronts with cutting lips, or "Tap-In" teeth
- square or round-bottom buckets, solid or tine-back
- shiftable, reversible spoil conveyor discharges to either side
- 16 or 20-in. rail-type treads; only 5 or 6 lbs. PSI pressure
- 55 HP diesel or 58 HP gas engine

Digs 6 FEET deep 13 to 31 in. wide

When your work schedule calls for additional gas transmission and distribution lines, it will pay you to look into the big work capacity of this Parsons 202 wheel-type Trenchliner. Its multiple operating speeds give maximum digging efficiency at every width, depth, and in all soil conditions. Specified grades are easy to maintain, because digging wheel responds instantly to sensitive friction-clutch control. Arched wheel frame, rigidly trussed, and three double-wheeled guide rollers keep digging wheel precision aligned. Let your Parsons distributor tell you more about this 202 utility Trenchliner. He can also show you 4 other sizes of wheel and ladder-type machines on crawlers . . . and a small rubber-tired Trenchmobile®.

Want more facts? mail to: PARSONS Company, NEWTON, IOWA Send us literature on the 202 Trenchliner

NAME ..... TITLE .....

COMPANY ..... DIV. .....

STREET .....

CITY ..... STATE .....

P469-GAS

PARSONS TRENCHLINERS®

(Koehring Subsidiary)

first order of business in the first session of this Republican Congress, and President Eisenhower signed it with relish. It was one of the first of his campaign promises to be carried through.

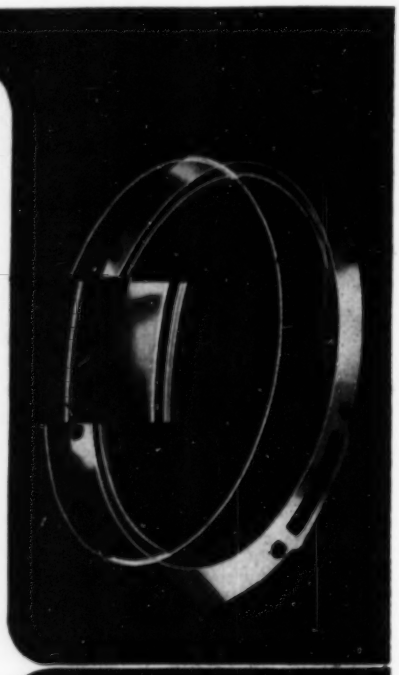
Sponsors of the original legislation—labeled "giveaway" boys by the "liberals"—have pointed out that the Supreme Court twice has refused to hear appeals from states challenging the constitutionality of the Congressional action. However, Senator Douglas and his colleagues base their new action on the theory that the action taken by Congress and the President has not taken place and cannot legally take place.

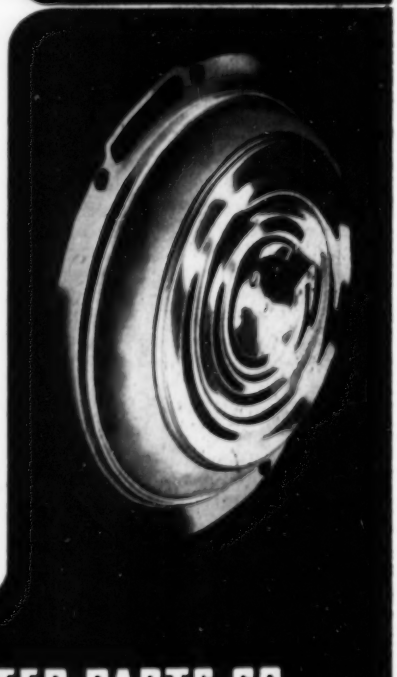
The Supreme Court, Senator Douglas' resolution notes, had ruled that the federal government originally acquired the offshore lands "in a proprietary . . . capacity." But Section 5 of the Congressional act passed last year plainly excepted from the act's workings "all lands acquired by the United States . . . in a proprietary capacity." Therefore, Senator Douglas reasons, the act actually does not apply to the offshore lands and they still are legally Uncle Sam's.

These
Lancaster S-7 Features Mean

BETTER METER RECORDS

For small meters, the sensational Lancaster S-7 Groove Type Metal Rim Diaphragm gives greater over-all accuracy and years longer service life. Lancaster diaphragms assure equal leather at both "in" and "out" strokes. You'll find shop tests better—measurement the same, stroke after stroke—with less fluctuation on the draft gauge. Specially processed leather stays supple, firm and retains oil through 10 to 20 years. For better meter records, put these big Lancaster S-7 features in your small meters. *Send today for free literature and prices.*





New Groove Type Metal Rim for greater rigidity and a perfect circle.

New Patented Endless Metal Tie Band for stronger clamping, more uniform depth of pocket.

New Improved Quality Rechrome Leather specially processed to Lancaster's own specifications.

*PATENT PENDING

METER PARTS CO.

Current Reading

"TENTATIVE STANDARD FOR FIELD WELDING OF PIPELINES"—This revised or second edition incorporates certain changes resulting from comments on the first edition issued in January 1953. Principal changes are in the radiographic section where rather extensive revisions have been made.

Published by the American Petroleum Institute, 50 W. 50th St., New York 20, the price is 50 cents per copy.

SHOWMANSHIP IN SAFETY—The National Safety Council's new book of attention-getting stunts and gimmicks wraps up in one package the best in safety promotional ideas.

Loaded with schemes that help sell safety to workers in new and appealing ways, the book can provide a lift for any accident prevention program. It contains more than 150 ideas for displays, demonstration, stunts, awards and other interest-arousing devices. It is illustrated with cartoons and bound in a two-color heavy paper cover.

For further information and quantity prices write the National Safety Council, 425 N. Michigan Ave., Chicago 11, Ill.

FACTORS IN THE SELECTION OF REFRACTORY MATERIALS FOR GAS-FIRED EQUIPMENT, prepared by Emil Blaha, Selas Corp. of America, for the subcommittee on glass and ceramics and issued by the AGA industrial processing committee.

This information Letter No. 59 covers refractory linings in all types of gas-fired industrial furnaces. As pointed out, the use of gas in industrial furnaces is favored from the standpoint of the materials employed to contain the heat, since harmful effects of less refined fuels may be entirely disregarded.

Copies are available from the AGA, 420 Lexington Ave., New York 17.

STATISTICS OF NATURAL GAS COMPANIES—Issued by Federal Power Commission, the new edition reports the 1952 operations and the status at the end of the year of the 150 natural gas companies filing annual reports with the FPC.

Copies are available from the Publications division, Federal Power Commission, Washington 25, D. C. at $5 per copy. The order number is FPC S-105.

STEEL PIPE FLANGES AND FLANGED FITTINGS (B16.5)—This American Standard has just been revised and supplemented because of new materials recently developed in this field. The revision provides for 15 different types of steel. It covers nominal pressures of 150, 300, 400, 600, 900, 1500 and 2500 psi, and includes references to valves.

The standard now provides a method for rating materials so recorded that it will be possible to give all new materials developed

in the future the proper pressure-temperature ratings.

Other new data in the standard are the designation of drain locations on valves and specifications for threaded, socket-welded, and butt-welded drain connections, and for the diameter of bosses for drains.

It is available from American Standards Association, 70 E. 45th St., New York 17.

STANDARD FOR FIELD WELDING OF PIPELINES—This is the second edition of API Std. 1104, published in February 1954. This edition is now available from the American Petroleum Institute, 50 W. 50th St., New York 20. Price: 50 cents per copy.

HEATING VENTILATING AIR CONDITIONING GUIDE—The 32nd edition of this guide, published by the American Society of Heating & Ventilating Engineers, is just off the press. It presents a new chapter on residential summer air conditioning. Included are new data on methods of obtaining local relief in hot humid environments, new information on recent developments in air and gas cleaning, new tables on steam requirements of process equipment, and more detailed data on characteristics of pipe and tube.

Recent research conducted by the society, or sponsored at leading universities, has influenced changes, revisions and additions to a large proportion of the chapters. Chapters brought up to date by major changes include: heating load, fuels and combustion, chimneys and draft calculations, panel heating, pipe, fittings, weldings, district heating, air cleaning, automatic controls, electric heating, and owning and operating costs.

Recent society research has been used as a basis for extending the data on the effect of shading of glass and for improving the rewritten chapter on air distribution. The technical data section has been enlarged to 1128 pages, representing an increase of 32 pages over the previous edition.

The guide is available from the ASHVE, 62 Worth St., New York 13. Price: $10.

PREPARING FOR THE UTILITY RATE CASE—In his recently published volume, Francis X. Welch, editor of *Public Utilities Fortnightly*, attempts to reduce practical instructions on the preparation for a public utility rate case to book form. His new book deals entirely with the various phases of preparation. It is to be followed by a companion volume dealing with the actual conduct of the trial of a rate case before regulatory commissions, or on appeal.

This first volume is designed to assist management—those who have the responsibility of starting the rate case preparation as distinguished from attorneys, who must carry it through subsequent phases of formal procedure. Various readers, however, will probably find that "Preparing for the Public Utility Rate Case" is equally valuable to anyone whose duties or special interests may be involved in the preparation and subsequent trial of a public utility rate case.

Mr. Welch's *modus operandi* was to make a selection of hand-picked representative rate cases involving various kinds of public utilities. Using the research facilities of *Public Utilities Reports*—the national reporting system for court and commission decisions affecting public utility regulation—he assembled the complete records of each case, plus letters, memoranda and other informal data. The book is essentially, therefore, a compilation, an editorial job—assembling the viewpoints of the different professional specialists whose individual efforts add up to the sum total of good rate case preparation.

The author's emphasis on public relations may surprise some. It is an aspect of rate case preparation which he apparently feels has been somewhat neglected in past practice. Some further idea of the scope of *Preparing for the Public Utility Rate Case* may be gained from some of the chapter titles: "The Birth of the Utility Rate Case"; "The Birth of the Rate Opposition"; "Nature of the Rate Proceeding"; "Events Leading Up to the Rate Case"; "Selection and Function of the Attorney"; "Grand Strategy of the Case"; "Mechanics of Case Preparations." Then follows detailed discussion of how to prove the rate base, expenses, depreciation, return, and organization of rate structure.

The book is available from the Public Utilities Reports Inc., Munsey Bldg., Washington 4, D. C. Price: $10.

ARCCO
LIQUID GRAVITOMETER
NOW 6 MODELS
Indicating Transmitting Liquid Gravitometer
...for pipelines, gasoline and chemical plants, refineries, etc.
Ruggedly built for hard field use but with laboratory accuracy, the long accepted ARCCO-Anubis Liquid Gravitometer with all its splendid features is now available for recording, controlling, indicating, transmitting, or various combinations of these functions. Write us fully about your application and request Bulletin No. 111 Revised.
1 RECORDING LIQUID.
2 INDICATING TRANSMITTING. Pneumatic
3 INDICATING CONTROLLING. Pneumatic
4 RECORDING TRANSMITTING. Pneumatic
5 RECORDING CONTROLLING. Pneumatic
6 RECORDING TRANSMITTING. Metameter
AMERICAN RECORDING CHART CO.
3113 E. 11th St. • Los Angeles 23, Calif.
SEND FOR BULLETIN No. 110

People

Promotions

GEORGE H. BLAKE has retired as president of Public Service Electric & Gas Co., Newark, N. J., after more than 40 years with the utility. He started with Public Service as a trial attorney, later becoming general solicitor. In 1937 he became a vice president, in 1943 executive vice president, and in 1945 president. He will continue as a member of the executive committee of the board of directors. LYLE MCDONALD, a vice president since 1944, has been elected chairman of the board and DONALD C. LUCE, vice president in charge of combined operations, succeeds Mr. Blake as president.

American Meter Co. has promoted HILDING V. BECK to the post of chief engineer for all engineering activities of the company, with headquarters in Erie, Pa. The company has also announced the appointment of E. JACK MOWRY as manager, industrial relations.

Central Illinois Light Co., Peoria, has elected E. D. EDWARDS, vice president of the company, and H. S. EBERHARD, executive vice president of Caterpillar Tractor Co., to the board of directors. They succeed R. C. LANPHIER JR., vice president of Sangamo Electric Co., and J. A. LONGLEY, retired Central Illinois president.

EDWARD F. MOORE has joined the Empire Stove Co., Belleville, Ill., as company branch manager in the San Antonio, Texas, area.

Maxitrol Co., Detroit, has announced the promotion of DAN J. TELL to its sales department, representing the company in Michigan, Ohio, and Indiana; and the appointment of HERB J. SCHLACHTER to the company's product development and research group.

D. J. Tell

H. J. Schlachter

Maxitrol

R. N. BENJAMIN, with the company since 1927, has been named president of Stone & Webster Service Corp., New York, succeeding GEORGE H. CLIFFORD, who has become chairman of the board.

ARTHUR KEHOE has retired as a vice president of Consolidated Edison Co. of New York.

G. KIRBY HERRINGTON, formerly assistant secretary, has been elected secretary and a director of New York State Natural Gas Corp., Pittsburgh.

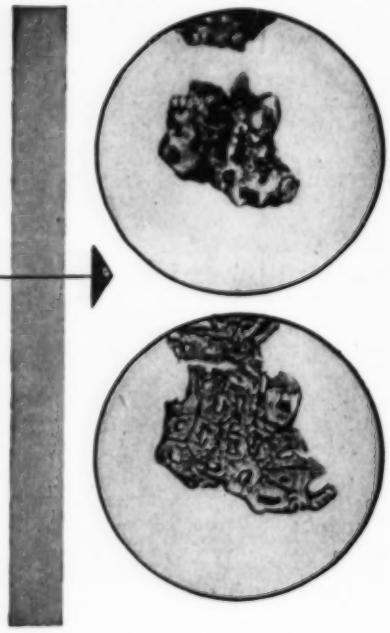
RUSSEL G. ALLEN has been elected executive vice president of Godfrey L. Cabot Inc., Boston.

RONALD A. MALONY has been elected president of the Bridgeport (Conn.) Gas Light Co., succeeding GEORGE S. HAWLEY, who has become chairman of the board and of the executive committee.

Changes in Brooklyn (N. Y.) Union Gas Co.'s customer service and manufacturing departments include THOMAS J. PERRY, assistant manager of customers service, promoted to district manager of the commercial department; EDWARD L. VERVOORT, former superintendent of the Kings service section, succeeds him in the customers service department position; and V. MARLOW PERRY, formerly of the manufacturing department, has been reassigned to the Kings position held by Mr. Vervoort.

Nordberg Manufacturing Co., Milwaukee, has named CARL O. FRIEND administrative manager, heavy machinery division. He is succeeded as manager of the gasoline marine

PROOF!



1. CARBOSEAL ANTI-LEAK
Trade-Mark

stops leakage due to dried-out fiber packing in bell-and-spigot joints.

PROOF: The dry jute fiber (magnified cross-section, top) swells as much as 44% when it's treated with CARBOSEAL anti-leak (bottom). In a joint all the fibers swell, openings between them close up, and leakage stops.

2. CARBOSEAL anti-leak gives lasting results.

PROOF: Distributors of dry gas have used enough CARBOSEAL anti-leak to treat 13,000 miles of 3-inch equivalent main. And the first joints treated with CARBOSEAL anti-leak—20 years ago—are still tight.

3. CARBOSEAL anti-leak is inexpensive.

PROOF: Cost of CARBOSEAL anti-leak to treat 1 mile of 3-inch equivalent main is about $100.

4. CARBOSEAL anti-leak is easy and economical to apply.

PROOF: Prove this for yourself. Write for a copy of our booklet, Form 4506 — also, our 16 mm. color-sound movie, "CARBOSEAL Anti-Leak," which we will lend you without charge.

CARBOSEAL ANTI-LEAK

Carbide and Carbon Chemicals Company
A Division of Union Carbide and Carbon Corporation
30 East 42nd Street UCC New York 17, N. Y.
In Canada:
Union Carbide Canada Limited, Toronto

"Carboseal" is a registered trade-mark of Union Carbide and Carbon Corporation.

engine department by HARRISON E. FELLOWS JR. H. W. DOW JR., formerly mid-eastern district manager, has become chief sales technician in the heavy machinery division.

JEANNE MONTGOMERY, Columbus district home service director of the Ohio Fuel Gas Co., has been named home service director of the Columbia Gas System's Charleston (W. Va.) group. SHIRLEY ANN NOLAN, home economist on Miss Montgomery's staff, succeeds her in the Columbus assignment.

CARL W. SHUPP has been appointed superintendent of distribution in the central division for the Southern California Gas Co., succeeding L. R. PICKUP, who has assumed duties as manager of the San Fernando valley division.

HOWARD B. EVERETT has been promoted to the post of manager of personnel for Southern Counties Gas Co., Los Angeles. He was formerly assistant manager of personnel.

MILLARD D. SHRIVER has been promoted to the post of general sales manager for Pannellit Inc., Chicago. He will be in charge of all sales and sales promotion activities of the parent organization as well as its Panascan division and Panalarm Products Inc., a subsidiary.

ROBERT H. KNOWLTON has retired as chairman of the board of Connecticut Light & Power Co., Hartford. The board elected GILBERT J. WILLIAMS executive vice president; ALFRED M. WADE vice president in charge of sales; and J. FRANCIS SMITH a director. The company also announced several promotions. DAVID W. PRICE is manager of the western division; EDWARD R. PETERSON, manager of the eastern division; JOHN W. BURG, central division engineer; W. LINDSAY BOOTH, East Hampton district manager; succeeding Essex district manager B. H. MC ELHOME, who has retired, is FRANCIS J. MELLON.

Additional promotions include: CALVIN T. HUGHES, vice president and consulting engineer; EUGENE B. RIPLEY, chief engineer; HAROLD M. KOPP, gas engineer; RUSSELL HICOCK, operating superintendent; JOHN R. BECCIA, utilization engineer.

Rochester (N. Y.) Gas & Electric Corp. has promoted JOHN MAC LARTY to supervisor of gas appliance service; JAMES DAVIS to superintendent of the east station; and GORDON L. CALDERWOOD to engineer of the gas production department.

CONRAD C. DESMOND and LESTER A. DUBBERKE have been promoted to the posts of manager of industrial sales and manager of commercial sales, respectively, for the Milwuakee (Wis.) Gas Light Co.

Temco Inc., Nashville, has promoted R. N. SMITH, formerly secretary-treasurer to

AN ANNOUNCEMENT OF ATOMIC IMPORTANCE
A NEW M-SCOPE PIPE FINDER

STOP..HOLD UP ON ALL PIPE
FINDER PURCHASES STOP

After 12 months of research, testing and development, Fisher Research Laboratory is proud to announce its new *"Electronic Witch"* M-Scope pipe finder.

THE FACTS ARE STARTLING:

1. The new ***"Electronic Witch"*** will out-perform and out-last any other pipe finder . . . will give greater accuracy . . . sharper . . . more pronounced indications of buried pipes, metal objects . . . is much less sensitive to outside interference .
2. Fisher's new M-Scope cabinets are made of special moulded unbreakable fiberglas, the very latest word in electronic instrumentation. Won't scratch nor stain. Can't be damaged by water. No more splinters, dents.
3. EVERY new ***"Electronic Witch"*** contains a super-sensitive leak detector circuit in the receiver. With a few inexpensive accessories you can have a ready-made Leak Detector.
4. AND most startling of all! The new ***"Electronic Witch"*** COSTS LESS TO OWN—ONLY $162.50!!! and LESS TO MAINTAIN!

There are many other features you will fully appreciate when you use this great new M-SCOPE . . . . 50% less "B" battery consumption; elimination of conventional loop antennas and beat oscillators to assure unsurpassed stability; the new Super-Power control for greater depth and tracing range. For more details and facts write for our new **"Electronic Witch"** folder.

FREE TRIAL OFFER

Sensational free trial offer: We'll send our **"Electronic Witch"** on a free 10-day trial basis if your company orders now. If not completely satisfied return it. Fair enough?

Fisher RESEARCH LABORATORY INC.
1961-65 UNIVERSITY AVE.
Palo Alto, California
DAVENPORT 2-4646

vice president and treasurer; C. F. BAUMAN, director of manufacturing, to vice president; and DUDLEY GALLOWAY to secretary.

Heath Survey Consultants Inc., Wellesley, Mass., has elected the following officers and directors: MILTON W. HEATH, president and general manager; MRS. ELIZABETH W. HEATH, treasurer; CHARLES A. HEATH, vice president and operations manager of the western division; MRS. ROSINA P. BURNHAM, assistant to the president; STUART B. EYNON, operations manager of the eastern division. Directors: Milton W. Heath, Mrs. Elizabeth W. Heath, DAVID E. PLACE, and ROBERT S. KITTREDGE.

DAVID BYRD, formerly assistant sales manager of Gar Wood's Wayne division, has been named sales manager of the Richmond (Calif.) division of the company.

JAMES P. C. DALRYMPLE has been appointed assistant treasurer in charge of credits of U. S. Steel's National Tube division. He succeeds WILLIAM R. LENGA, who has been transferred to the New York treasurer's office.

WILLIAM J. CROWLEY, a 28-year veteran with Commonwealth Edison Co., has been elected comptroller of the newly formed subsidiary, Northern Illinois Gas Co.

H. K. Woodward

J. D. MacGuffin

Briggs Filtration

H. K. WOODWARD, formerly regional manager of the north eastern and north central regions, has been promoted to general industrial salesmanager of the Briggs Filtration Co., Bethesda, Md. In other promotions, JOHN D. MACGUFFIN becomes regional manager of the north central region, Chicago, and C. J. DEVRIES, regional manager of the south eastern territory.

K. C. CHRISTENSEN, treasurer of Pacific Gas & Electric Co., San Francisco, has been elected a director of the company.

THOMAS D. CABOT has been elected president of Godfrey L. Cabot Inc., Boston, succeeding DR. GODFREY L. CABOT. Dr. Cabot will remain as chairman of the board.

E. K. THORGAARD, vice president and manager of the Minneapolis (Minn.) division of Northern States Power Co., has been elected a director of the Minneapolis Chamber of Commerce.

G. KIRBY HERRINGTON has been elected a director and secretary of New York State Natural Gas Corp., Pittsburgh. He was formerly assistant secretary of the Peoples

7 REASONS WHY THIS VALVE IS FIRST CHOICE TODAY AMONG LEADING PRODUCERS OF HEATING EQUIPMENT

THERMAC

LARGER CAPACITY LOW PRESSURE DROP

LOW COST

GREATER STRENGTH AND RIGIDITY

PERMITS SMALLER, LESS EXPENSIVE CONTROLS

PRECISION CAST, MACHINED AND LUBRICATED

NON-CORROSIVE

AGA CERTIFIED

ALUMINUM ALLOY

Manual Main GAS SHUT-OFF VALVE

Chief reasons for the unprecedented acceptance of the Thermac Aluminum Alloy Manual Main Gas Shut-Off Valve are its low cost and larger capacity (less restrictive effect). This means that frequently smaller, less expensive controls including the regulator can be used. Thermac Model 400-¾" valve for example, will flow 800,000 BTU of natural gas at .5" water column pressure drop. Compare this with any other valve and compare the cost too. You will find it a natural for your own installations. Samples and prices on request.

THERMAC APPLIANCE REGULATOR

For maximum economy specify Thermac regulators with Thermac Manual Main Gas Shut-Off Valves.

THERMAC HM COMPANY

800 EAST 108TH STREET • LOS ANGELES 59, CALIFORNIA

Good press relations at work

"Lone Star Gas Co. is going to do something we've been expecting for a year or two. The company, which supplies gas to Walters consumers and those in various points of the state, is going to ask for a rate increase. It isn't for us to say the company is not entitled to a rate boost, particularly in the lower consumption bracket. Greatest error the company could have made in the boost is in timing. Had the increase come along a couple of years ago when it looked like money was going to belong to everyone, the effort to get the hike would have been much simpler. Our advice is a little late for that, however, and the price of gas is going to have to be a lot higher before we return to wood or coal burners."

—*Walters (Texas) Herald*

Natural Gas Co. and New York State Natural.

PHILIP KRAFT, vice president of Piedmont Natural Gas Co. Inc., Charlotte, N. C., retired recently.

New faces

Sprague Meter Co., Bridgeport, Conn., has appointed CHRISTOPHER SPROUL to the post of sales engineer, working with the northeast division and eastern Canada and PAUL SCHIENDER, who will cover the states in the northwest division of the U. S. and western Canada.

P. Schiender

C. Sproul

Sprague Meter

E. O. OLSEN has joined the Incineration division of Bowser Inc., Cairo, Ill., as manufacturers' agent in North and South Dakota, Nebraska, Minnesota, Wisconsin, Iowa, and the northern part of Illinois.

Mountain Fuel Supply Co., Salt Lake City, has elected VAL A. BROWNING, president of Browning Arms Co., as a new director of the company.

TERRENCE H. M. TAYLOR, former research scientist with the U. S. Atomic Energy Commission, has been named chief engineer of Rockwell Manufacturing Co.'s Nordstrom valve division plant at Oakland, Calif.

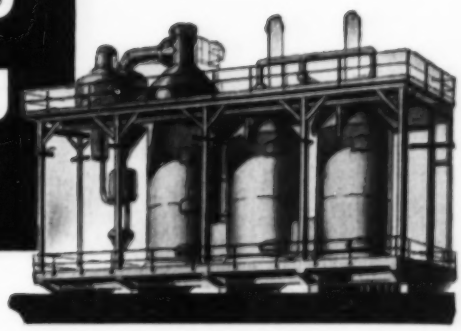
ROBERT W. RAY has joined the Ward Heater Co., Los Angeles, as general manager of the company's Los Angeles office. He succeeds to the tasks handled by RUSSEL JARRETT, retiring vice president and general manager.

EDWIN THOMES has joined Dearborn Stove Co., Dallas, as range engineer. He will direct all work on the company's domestic range projects. THOMAS H. COPELAND has been named supervisor of the new tabulating department, and WESLEY O. EARNST has rejoined the company as head of the cost accounting department.

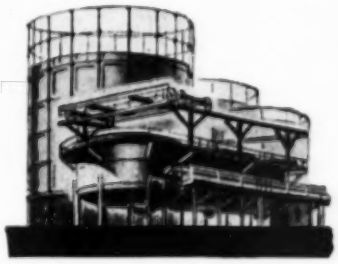
Piedmont Natural Gas Co., Charlotte, N. C., has elected CARTER L. BURGESS, assistant to the president of the University of South Carolina, to the board of directors.

LEWIS F. MALDEIS and ROBERT D. BUTLER have joined American Car & Foundry Co. as sales engineers for ACF valves. Mr. Maldeis, with headquarters in Pittsburgh,

GASMACO pioneering since 1902

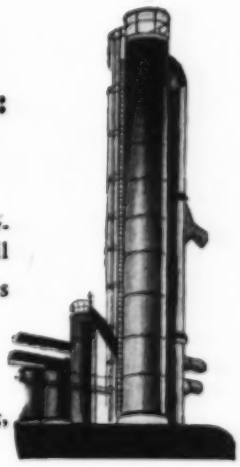


means continuous service and profit to you

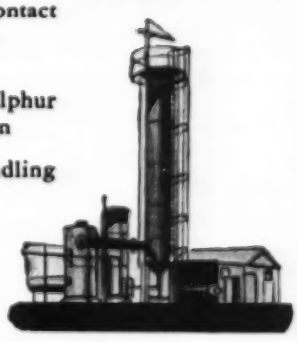


GASMACO has pioneered at least nine major contributions to the gas industry since 1902 comprising new services, new processes, and new equipment.

look at the versatility which GASMACO processes and equipment provide today:



- Low Cost Conversion of Existing Gas Sets to Hi-Btu Oil Gas
- Other Oil Gas Methods for Standby and Peak Shaving, Efficiently Designed for Light or Heavy Oil
- Latest Designs for New and Complete Oil Gas Plants — Base Load or Peak Shaving
- Continuous Gas Generation, Utilizing LPG or Gasoline Feeds
- Water Gas Apparatus, Solid Fuel Bed Reforming, Auxiliary Gas Plant Fixtures
- Gas Cooling — Condensers and Direct Contact Scrubbers — Effluent Decantation and Heat Exchange Systems
- Purification Equipment for Removal of Sulphur Compounds — Low or High Pressure Design
- Oil Scrubbing, Light Oil Recovery, Tar Handling and Other By-Product Recovery
- Auxiliary LPG Systems
- Liquefaction, Storage and Regasification of Natural Gas



Consult us first for dependable equipment that supplies greater profit to you and better service to your customers. Your inquiry will receive prompt and competent attention.

THE GAS MACHINERY COMPANY
16108 WATERLOO ROAD
CLEVELAND 10, OHIO

Designers • Fabricators • Erectors
Gas Plant Equipment and Industrial Furnaces
THE GAS MACHINERY CO. (Canada), Ltd.
HAMILTON, ONTARIO

will cover part of Ohio and West Virginia, while Mr. Butler, with Jacksonville, Fla., as his headquarters, will cover Florida, Georgia, Alabama, Mississippi, and western Tennessee.

Honors

GERALD SCHLESSMAN, president of Greeley (Colo.) Gas Co., has been named to the taxation committee of the National Association of Manufacturers.

NORMAN R. SUTHERLAND, vice president and general manager of Pacific Gas & Electric Co., San Francisco, has been elected a director of the California State Chamber of Commerce.

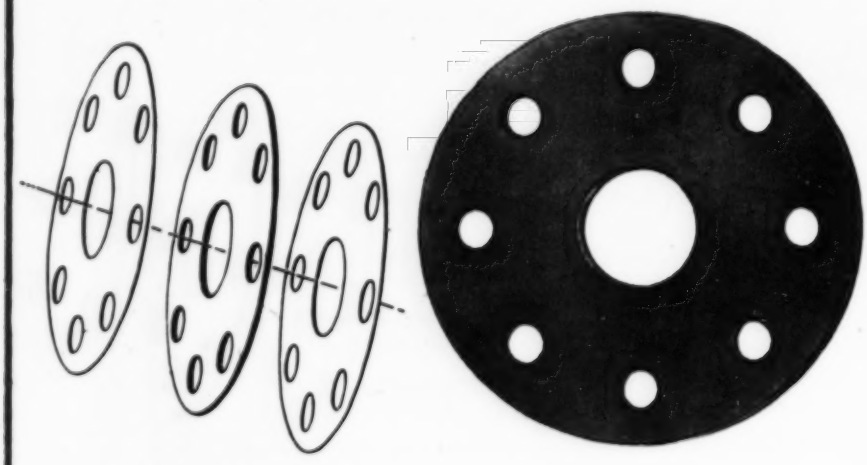
Deaths

JACK BERNARD BENTLEY, general manager of the Titan Valve & Manufacturing Co., Cleveland, died in April. He was 32. Mr. Bentley's father founded Titan Valve, which manufactures thermostatic control valves.

S. E. CRITCHFIELD, 48, manager of the San Fernando Valley division for the Southern California Gas Co., died recently. Mr. Critchfield had been with SoCal since 1939, serving as industrial service engineer at Taft, superintendent of maintenance in the butadiene plant, and superintendent of residential service in the customer service department before his San Fernando assignment.

INSULKET*

THE "SANDWICH" GASKET



- INSULKET has a hard plastic core and sealing surfaces of a special ASBESTOS compound.
- The plastic core serves as an electrical insulator for use with cathodic protection work.
- The ASBESTOS surfaces are soft enough to seal easily, yet so tough they will not squeeze out under pressure.
- INSULKET is put together under high pressure and heat, and will not separate.
- Working pressures over 2000 p.s.i. W.O.G.
- Sizes up to 48½" OD.

*INSULKET—PATENT PENDING

SERVICE ENGINEERS, INC.

Manufacturers of Industrial Plastic Products

3030 W. Pafford P. O. Box 11068 Fort Worth 9, Texas

CALENDAR

May

2-4..Gas Compressors Institute. Legion Hall, Liberal, Kan.

4..NEGA Operating Division — Sheraton - Biltmore Hotel, Providence, R. I.

5..New Jersey Gas Association Home Service Conference — Military Park Hotel, Newark.

9-12..LPGA Convention — Conrad Hilton Hotel, Chicago.

10-14..AGA Commercial Gas School Chicago.

10-14..35th Annual National Restaurant Convention & Exposition — Navy Pier, Chicago.

12-13..PCGA Gas Supply & Transmission — San Francisco.

13-14..Public Utilities Advertising Assn. — Hotel Statler, Boston.

17-21..National Fire Protection Assn.—Statler Hotel, Washington, D. C.

18-20..Pennsylvania Gas Association — Pocono Manor Inn, Pocono Manor, Pa.

19..NEGA Appliance Servicing Conference—Sheraton Hotel, Worcester, Mass.

19-21..GAMA Annual Meeting — The Drake Hotel, Chicago.

24-26..AGA Production and Chemical Conference — William Penn Hotel, Pittsburgh.

27-28..Natural Gas & Petroleum Assn. of Canada — Prince Albert Hotel, Windsor, Ontario, Canada.

31-4..Institution of Gas Engineers —Bournemouth, England.

June

1-3..Edison Electric Institute Annual Meeting — Atlantic City, N. J.

2-3..PCGA Building Design & Maintenance Conference — La Jolla, Calif.

2-3..AGA Research & Utilization Conference — Hotel Statler, Cleveland.

2-4..Gas Technology Short Course. Texas College of Arts & Industries, Kingsville, Texas.

7-11..Practicing Law Institute & AGA Symposium on Current Legal Problems of the Gas Industry— New York.

7-9..Institute of Cooling & Heating Appliance Manufacturers—Netherland Plaza, Cincinnati.

13-18..American Society for Testing Materials Anuual Meeting and Exhibit — Sherman Hotel, Chicago.

20-24..Canadian Gas Assn.—Banff Springs Hotel, Banff, Alberta.

21-22..AGA Residential Gas Section, New York-New Jersey Regional Gas Sales Conference — Monmouth Hotel, Spring Lake, N. J.

27-29..Wisconsin Utilities Association Accounting Section — Dell View Hotel, Lake Delton, Wis.

28-29..Michigan Gas Assn.—Grand Hotel, Mackinac Island, Mich.

July

6-9..American Home Economics Association—San Francisco.

August

23-25..Appalachian Gas Measurement Short Course — West Virginia University, Morgantown, W. Va.

September

8-10..31st Mid-West Gas School and Conference, Iowa State College — Hotel Sheldon-Munn, Ames, Iowa.

8-10..Pacific Coast Gas Assn. — Victoria, British Columbia.

13-14..Independent Natural Gas Association of America Annual Meeting — Roosevelt Hotel, New Orleans.

17-18..Maryland Utilities Assn., Fall Conference — Virginia Beach, Va.

28-29..Texas Mid-Continent Oil & Gas Assn. — Baker Hotel, Dallas.

October

7-8..California Natural Gasoline Assn. Annual Fall Meeting. Ambassador Hotel, Los Angeles.

11-13..AGA Annual Convention — Atlantic City, N. J.

18-22..National Safety Council — Chicago.

27..NEGA Operating Division — Hotel Statler, Hartford, Conn.

November

1-5..National Metal Exposition—Chicago, Ill.

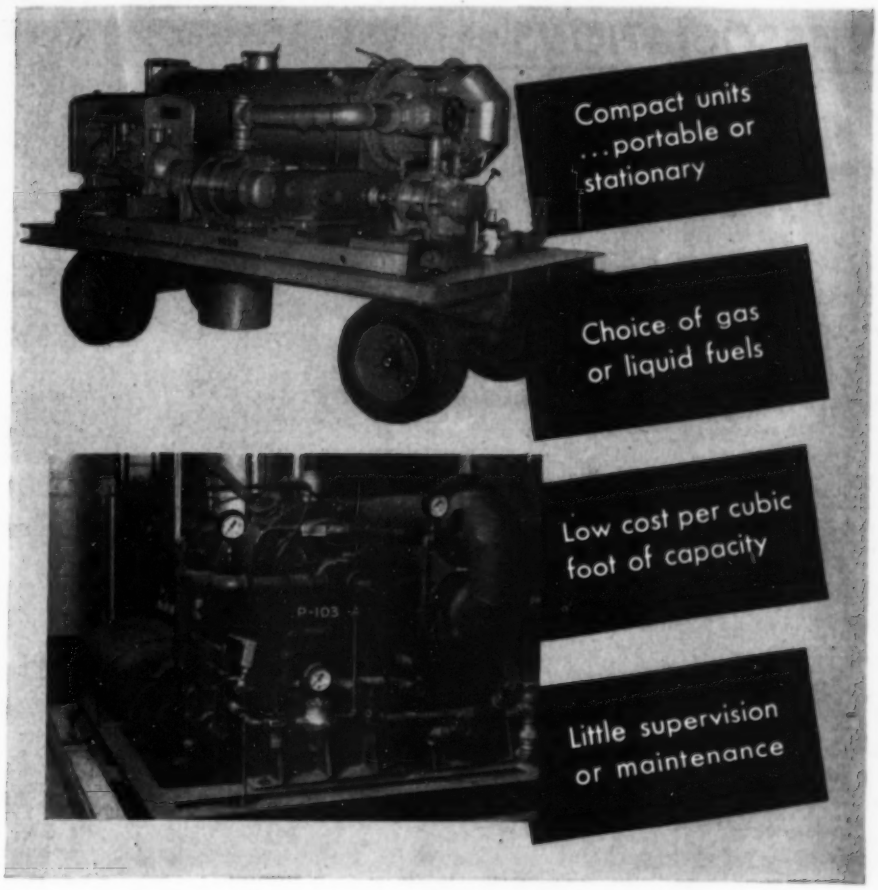
8-11..American Petroleum Institute—Conrad Hilton Hotel, Chicago.

17..NEGA Safety Conference — Hotel Statler, Boston.

17-19..Wisconsin Utilities Association, Electric & Gas Section, Technical & Sales & Service Divisions — Hotel Schroeder, Milwaukee.

December

7..NEGA Appliance Servicing Conference — Hotel Statler, Boston.


Compact units ...portable or stationary
Choice of gas or liquid fuels
Low cost per cubic foot of capacity
Little supervision or maintenance

BE SURE OF "BIG 4"

VALUES IN INERT GAS GENERATORS

For protection against fire and explosion hazards, suitable Inert Gas Generators usually pay their own way, in reduced insurance premiums and property damage. We suggest that when considering such equipment, you compare the 4 basic values of Roots-Connersville units.

To many users, the flexibility of R-C equipment offers a foremost advantage. Portable or stationary units, in a wide range of capacities, give the required protection, when and where needed. Ability to operate on either gas or liquid fuels is important in many locations. Because R-C units are so simple in design, they can be kept in constant readiness, with little attention. Yet all these values are obtainable at a very low cost per cubic foot of capacity.

Our engineering facilities are at your command, to help you select R-C Inert Gas Generators that will give you the greatest amount of protection at the lowest cost. Or, ask for Bulletin 100-B-14 for descriptions and details.

ROOTS-CONNERSVILLE BLOWER

Reg. U.S. Pat. Off.

A DIVISION OF DRESSER INDUSTRIES, INC.
554 Oregon Ave. • Connersville, Indiana

Specialists in handling gas and air

INGAA public information workshop has birthday

INGAA's year-old public information program had its first birthday party in New Orleans March 29, and congratulations flowed on the lustiness of the young giant.

Eighty-five representatives of the production, transmission, and distribution branches of the industry were there to learn, through the medium of the Independent Natural Gas Association of America's second annual public information workshop, how successful

INGAA ADVERTISING SHOWN AT WORK FOR COMPANIES LOCALLY
AND HELPING INDUSTRY NATIONALLY
INGAA NEWSPAPER ADS & MATS AVAILABLE UPON ORDER

Exhibits of ads produced by the INGAA and their use by individual natural gas companies from all segments of the industry were displayed during the workshop.

the program has been in bringing together their separate branches under an umbrella of public good will.

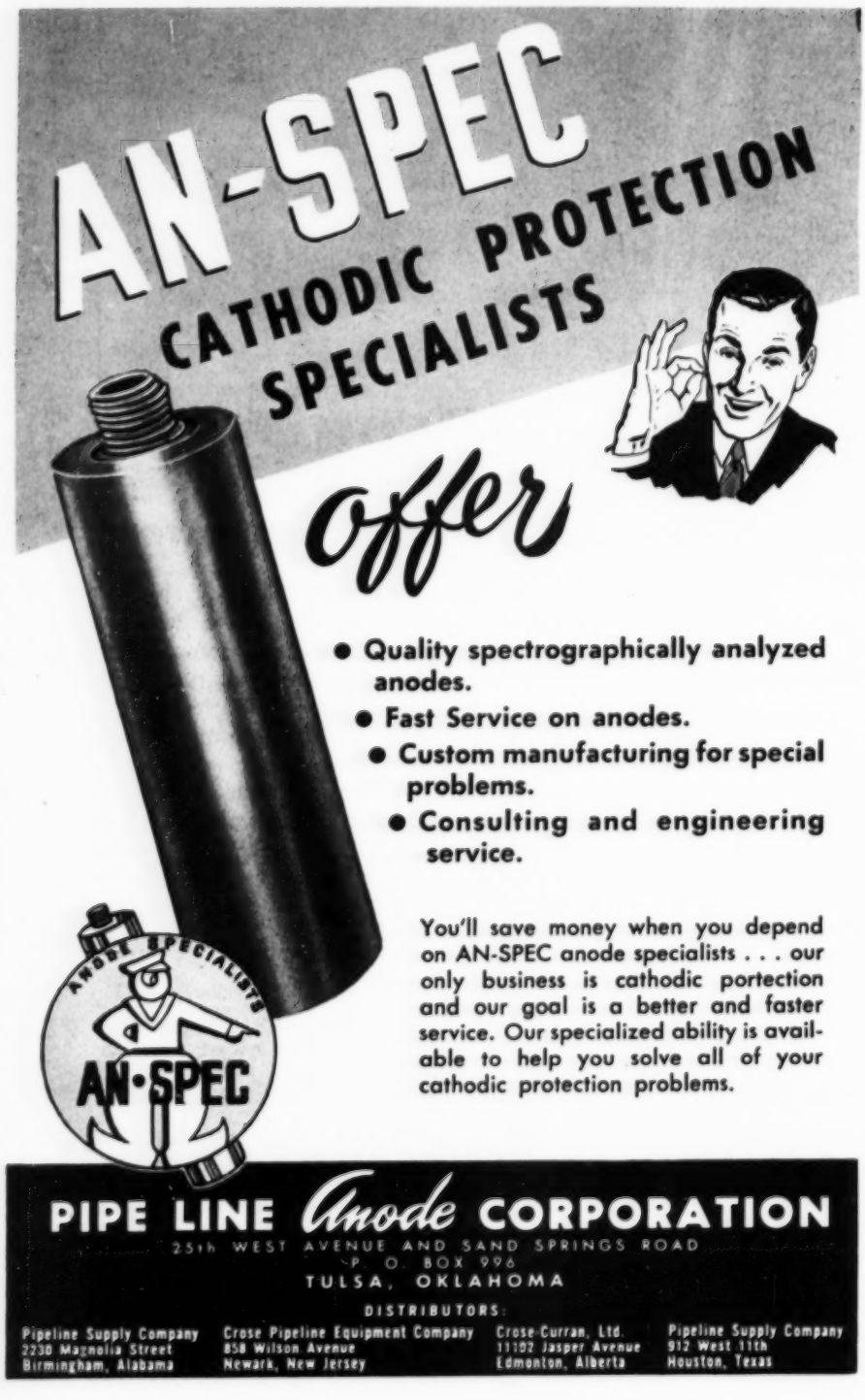
The program in its first year concentrated its fire on the single target, production, with the keynote, "Production is the key to supply —and it is more important to get natural gas at its real competitive value than not to get it at all." Now, according to the announcement of Advisory Committee Chairman W. E. Wilson of United Gas, the campaign is ready to move into the distribution and transmission phases of the industry.

"One of the greatest accomplishments of the program this first year," Mr. Wilson told his audience, "has resulted from the assembling of producers, pipeliners, and distributors in the same rooms, on the same committees, and in workshop conferences. The INGAA program unquestionably has brought many men throughout the industry a better understanding of the other fellow's problems.

"Every effort is being made to encourage coordination of the INGAA program with those of other industry associations. The Southern Gas Association, for example, has expressed its desire to work with INGAA in telling the broad industry story. The public information committee of AGA, under the able leadership of Bill Kimball, has moved recently to achieve effective coordination between AGA programs and the INGAA program. The Gas Appliance Manufacturers Association and the American Petroleum Institute have also indicated their desire to coordinate efforts with INGAA."

Stressing the fact that the keyword in the campaign is "coordination," Mr. Wilson expressed his gratitude to both Mr. Kimball, who is public relations director for Columbia Gas System, and R. C. Kay, an Amarillo (Texas) producer, both of whom assisted in arranging the conference, along with S. D. Whiteman, president of the Kansas-Nebraska Natural Gas Co., Hastings, Neb., who presided.

A portion of the day's activities were un-


AN-SPEC
CATHODIC PROTECTION
SPECIALISTS
offer
• Quality spectrographically analyzed anodes.
• Fast Service on anodes.
• Custom manufacturing for special problems.
• Consulting and engineering service.
You'll save money when you depend on AN-SPEC anode specialists . . . our only business is cathodic portection and our goal is a better and faster service. Our specialized ability is available to help you solve all of your cathodic protection problems.
ANODE SPECIALISTS
AN-SPEC
PIPE LINE Anode CORPORATION
25th WEST AVENUE AND SAND SPRINGS ROAD
P. O. BOX 996
TULSA, OKLAHOMA
DISTRIBUTORS:
Pipeline Supply Company
2230 Magnolia Street
Birmingham, Alabama
Crose Pipeline Equipment Company
858 Wilson Avenue
Newark, New Jersey
Crose-Curran, Ltd.
11102 Jasper Avenue
Edmonton, Alberta
Pipeline Supply Company
912 West 11th
Houston, Texas

der the direction of Vincent R. Fowler, vice president of Bozell & Jacobs Inc., counsel for the PR program. Mr. Fowler gave an account of the materials available for company use—the advertising package, the speakers' kit, the employee information series, and the brand new public relations exchange bulletin.

The first series of five months' ads included two sets of companion ads, one for production and pipeline companies, the other for distribution companies, but with both sets stressing the production theme. Forthcoming ads, Nos. 6, 7, and 8, and a companion set, are devoted to transmission and utilization themes.

The employee information series includes "Know Your Industry" quizzes in proof form and mimeographed editorial features for employee publication use. The national speakers bureau has an initial objective of placing industry speakers before other gas industry groups and allied organizations to explain the information program. Future speaking activities will move out among public gatherings.

C. P. Rather, president of INGAA and Southern Natural Gas Co., explained the "grass roots" approach of the public information program—how it works on a voluntary basis, and how most of the activities are carried on by individual participants in their home territories. He reiterated the committee's plea for assistance and suggestions from the field.

Another industry speaker was Ray Ratliff of Kansas City, Mo., director of advertising and publicity for the Gas Service Co., who told how "Employee Information Can Work for Better Company and Industry Public Relations." Mr. Ratliff pointed out that there are 6500 employee publications in the country, and stressed their value as an information medium. He strongly urged the use of INGAA materials in gas industry employee organs.

Outside experts who contributed their views to the workshop were Robert H. Da-

Stuart F. Silloway (left), of Mutual Life, spoke on public relations and advertising at the INGAA workshop. S. D. Whiteman (right), of Kansas-Nebraska Natural, headed the committee on arrangements.

"Better get a quote from ECLIPSE"

. . . FOR FAST SERVICE ON GAS COCKS

STANDARD—Eclipse iron body brass core construction serves better, longer. Individually tested at 125 lbs. and guaranteed as to gas-tightness, accuracy and alignment of tappings.

"RETAINED KEY" — Tamperproof construction . . . offers in addition the assurance that key will not be blown from or pulled out of the body even though the lock nut is removed or the tail piece snapped off.

Both types available for immediate, partial shipment, in flat head or lock wing style, black or galvanized finish.

. . . COMPLETE STOCKS OF RIGID METER BARS

STANDARD UNION, with standard type, gasket or ground joint union. Simplify and speed setting, give maximum protection to the meter. ALSO AVAILABLE WITH INSULATED UNION.

SLEEVE UNION, with threaded, one-piece sleeve union connections . . . no gasket required. Soundness and accuracy guaranteed.

COMPRESSION TYPE has threadless connection for "stab fit" of pipe. Gives maximum protection, plus new speed, flexibility and low cost meter settings.

All types available with or without integral gas cock (standard or "retained key") in wide range of sizes and styles.

ECLIPSE FUEL ENGINEERING CO., ROCKFORD, ILLINOIS

ECLIPSE FUEL ENGINEERING CO. OF CANADA, LTD., TORONTO, ONTARIO

GAS COCKS — Eclipse — METER BARS

Write today for new Eclipse Rigid Meter Bar Bulletin, P-1; Gas Cock Bulletin, P-12.

Eclipse Fuel Engineering Co., 1109 Buchanan St., Rockford, Illinois

( ) Please send new Meter Bar Bulletin P-1
( ) Please send Gas Cock Bulletin P-12
( ) Please send samples for inspection and test.

Firm Name_____
Individual_____
Address_____
City_____ State_____

vidson, press relations supervisor for Chesapeake & Potomac Telephone Co., Washington, who talked on "Washington and Local News Coverage"; Stuart F. Silloway, vice president of Mutual Life Insurance Co. of New York, giving a life insurance executive's view of "Gas Industry Problems of Public Interest"; and Will A. Parker, president of Film Counselors Inc., New York, speaking on "Business-Sponsored Films as a Public Relations Tool."

(Complete information on how to participate in the program—which is open to non-members as well as members—is available from John A. Ferguson, executive director, INGAA, 918 Sixteenth St., N.W., Washington 6, D. C.)

Chemical, engineering conference readies program

One of the most comprehensive programs ever sponsored by the AGA operating section will be presented at the chemical, engineering, and manufactured gas production conference scheduled for May 24-26 at the William Penn hotel in Pittsburgh.

First-day general sessions will feature talks on fundamentals of plant testing for corrosion, gas odor test equipment, continuous production of natural gas substitutes by complete gasification of light distillates, appliance tests on the substitutability of high-Btu oil gas for natural gas, and production of high Btu-gas with the TPC process.

Wednesday's general sessions will have discussions on corrosion in water-sealed gas holders, continuous determination of suspended solids in fuel gas as an aid in control of production equipment, sensible smoke control, summary of tar handling experiences, and studies of coal expansion.

Carbonization and coke, use and handling of L. P. gases, quality control, odorization, large volume gas measurement, high Btu gas, low Btu gas, plant waste disposal, and chemical sessions will highlight the luncheon conferences.

During the chemical meeting, reports will be given on the revision of the pressure piping code, on natural gas measurement for the gas plant, and practical problems of odorization.

Advertising and PR men to gather in Boston

Record numbers of public utilities advertising and public relations executives are expected in Boston's Hotel Statler May 13-14 for the 33rd annual convention of the Public Utilities Advertising Association.

Some of the speakers who are expected to appear on the program include Raymond Moley, contributing editor, *Newsweek Magazine*; Dr. Claude Robinson, president of the Opinion Research Corp.; Leonard Dreyfuss, president of United Advertising Corp.; Walter Sammis, president of the Edison Electric Institute; and E. H. Eacker, president of the AGA and of the Boston Consolidated Gas Co.

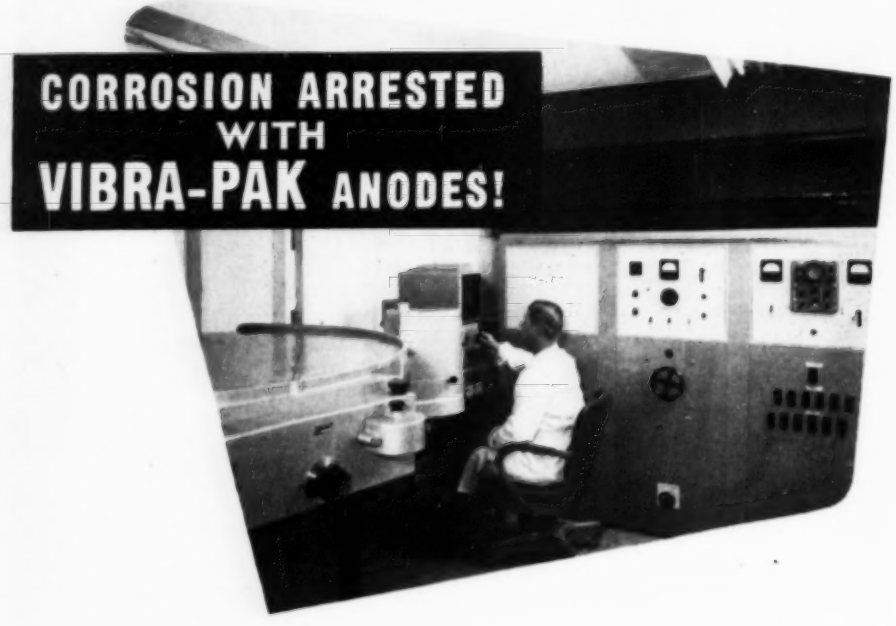
In addition, the majority of convention sessions will deal directly with advertising and public relations case studies, touching such subjects as institutional and merchandising advertising, and an analysis of utility advertising costs.

NEGA continues growth pattern for eighth year

The year 1953 proved to be a successful one for the New England Gas Association, as revealed by Clark Belden, managing director, in his annual report presented to the recent NEGA annual convention.

Among accomplishments is the group's new high in membership—the eighth successive year of such growth. The present number of company members is 369. Eliminating mergers, this figure represents a company membership increase of around 96% in the last eight years.

Other accomplishments include a trend toward joint meetings of two different groups for a consideration of various matters of mutual interest, which has resulted in the organization of two new units within the NEGA: a promotional planning council and a service coordinating council. During 1953 there were 35 division and group meetings and there was continued close cooperation between the NEGA and the AGA with one two-day joint meeting. In addition, the in-



CORROSION ARRESTED WITH VIBRA-PAK ANODES!

A major pipeline company corrosion engineer gives this authentic case history of how, after using many different corrosion control practices, he switched to VIBRA-PAK anodes with these results!

"Endeavoring to find an anode which would give us maximum efficiency and longer life, we tried Standard Magnesium Corporation cylindrical anodes and found they returned more current per pound of *magnesium and received more life per anode.*

I'm sold on Vibra-Pak high purity magnesium anodes, made to spectrographic analysis."

—VIBRA-PAK anodes are spectrographically analyzed for metal purity . . . *your guarantee of longer service life!*

—a new, patented spiral core won't separate from anode . . . *positive contact is assured!*

—and remember, VIBRA-PAK means the anode is compacted and centered in the backfill through shipping, handling and placing it in the hole.

Represented By

Moorlane Company
Tulsa, Okla.
Kansas City, Mo.
Amarillo, Texas
Denver, Colo.
Wichita, Kansas
Oklahoma City, Okla.

Midwestern Engine & Equipment
Tulsa, Okla.
Pittsburgh, Pa.
Atlanta, Ga.
Chicago, Ill.
Oklahoma City, Okla.

H. E. Davis
Los Angeles, Calif.

Robert F. Riley
Miami, Florida

Midwestern, Inc.
Houston, Texas

Standard Magnesium Corporation
TULSA, OKLAHOMA

Pioneers of: SPECTROGRAPHICALLY ANALYZED ANODES AND CYLINDRICAL ANODES

dustrial division conducted its annual two-day school, which was attended by more than 100 members.

Mr. Belden also pointed out that the trend toward more gas utility mergers has continued with more such consolidations during 1953 than during any previous year. Eleven companies were involved in such mergers. There are now only 58 gas utilities in the NEGA, although they represent more than 99% of the New England gas meters. According to association records, 38 gas utilities have become 15 companies since 1934, with 23 companies disappearing in the process.

In his president's address, "We Pause to Contemplate," J. L. Johnson, of the Providence Gas Co., said, "Success will not abide with our industry except as new developments are directed toward increasing our usefulness to the public whom we serve and upon whom our very existence depends."

In reviewing past NEGA presidents' addresses, including wartime President Charles Young, who spoke on the problem of servicing appliances promptly and efficiently, Mr. Johnson said, "Today . . . we still are unable to afford the time or expense of repeat calls. Of equal importance, we cannot afford the growing dissatisfaction on the part of the customer that results from repeat calls."

The service coordinating council, which was formed during 1953, will study the need for the establishment of facilities for training gas appliance servicemen throughout New England. "There's also the matter of standardization of the terminology of appliance parts . . ." Mr. Johnson continued.

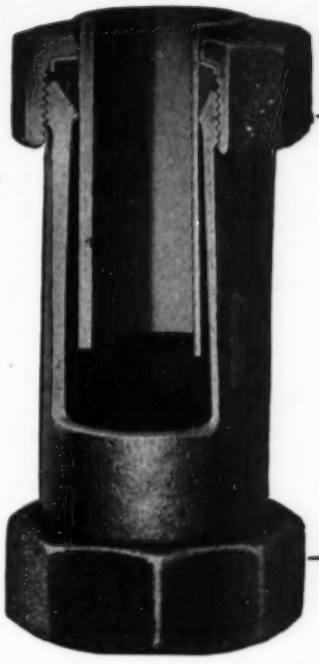
On the subject of rates, he said, "It is entirely possible that our industry will find that, by reducing prices somewhat to certain classes of customers, the increased volume of business obtained from the potential available will prove such a decrease in price to have been a well-advised venture."

New officers of the NEGA are Roy E. Wright, NEGEA Service Corp., president; Harold E. Ayer, Lynn Gas & Electric Co., 1st vice president; Fred H. Faulstich, Springfield Gas Light Co., assistant vice president; Otto Price, Boston Consolidated Gas Co., treasurer.

Oklahoma Utilities group has largest convention

The largest convention of the Oklahoma Utilities Association was held recently with about 550 in attendance at the Oklahoma City affair.

Important speakers and timely subjects brought the record-breaking crowd together. Among speakers and their subjects were D. W. Reeves, of the Public Service Co. of New Mexico, "Socialization Through Taxation"; Marvin Chandler, of Reis & Chandler Inc., "How Public Utilities Look to the Investor"; Kinsey M. Robinson, Washington Water Power Co., "Your Responsibility in Getting Things Done"; C. I. Wall, Pi-



NORMAC

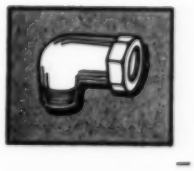
Couplings, Sleeves and Fittings

for maximum deflection, ease of "stabbing," complete confinement of the rubber!

So close are "Normac" rubbers confined at the gasket tip that possibility of flow is reduced almost to "nil." These couplings, sleeves and fittings . . . approved by gas utility men across the country for their time-saving features, ease of handling and dependable service . . . are available in a complete range of sizes. Made from air furnace malleable iron they provide greater wall thickness than pipe on which used.

NORMAC COUPLINGS are made with 5" centers in all sizes. NORMAC SLEEVES are identical in design except that they are made with 10" centers. Nuts and gaskets are interchangeable.

Compression-End Service "Tee"—First fitting of this type ever produced with full coupling depth and special threads on male end to prevent dropping into old hand taps when used to replace standard threaded fittings.



Compression-End Service "Ell" — Extra depth makes it possible to "stab" pipe into stops and without measuring, pull back a safe distance to allow ultimate deflection eliminating possibility of strain against tap in main.

Compression-End Iron Body Brass Core Service Stopcocks—End the necessity of threading on the job plus the elimination of the threads themselves—combining all the advantages of NORMAC COUPLINGS and the best in stopcock design. 2½" coupling depth on each end.

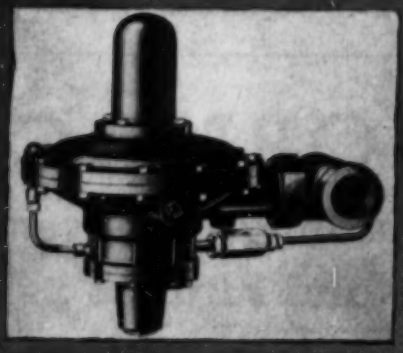
Normac Brass Fittings Developed in 1939 for Use with Copper Tubing—Our complete line of brass fittings can be used either on new installations or where copper is run through old steel pipe in large or small openings. The center to end dimensions of NORMAC TEES correspond with old malleable iron fittings. This feature is extremely important in the use of these fittings in one foot openings where the tubing must line up with the steel which has been removed.

Write for the NORMAC CATALOG of Gas Distribution Equipment

NORTON-McMURRAY MFG. CO.

122 SOUTH MICHIGAN AVENUE - - - CHICAGO 3, ILLINOIS

Couplings • Motor Bars • Sleeves • Cocks • Bell Joint Clamps • Service Tees & Ells

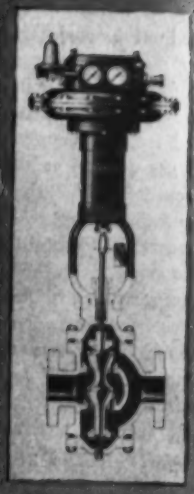


TYPE 99

Self-contained pilot-operated gas regulator for small border stations and industrial applications. 2" size only. Reduced pressure range 4 ozs. to 65 lbs.

TYPE 840

The Fisher King Booster is an entirely self-contained pressure controller. It will maintain a constant pressure at the low pressure point in the distribution system regardless of demand load.

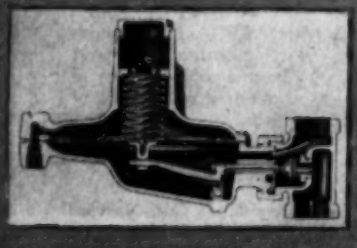


TYPE 4100D-57T

High-pressure reducing valve for border stations — high-pressure regulation and industrial applications.

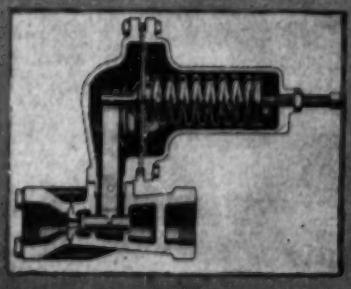
AMERICA'S BES

FISHER® America's



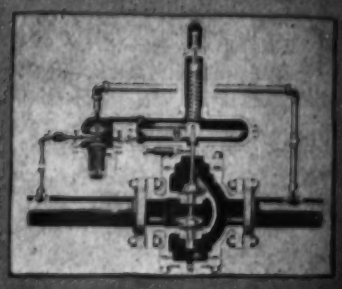
TYPE 730C

Standard gas service regulator with or without integral relief valve, bug-proof vent. Sizes ¾" to 2".



TYPE 630

"Big Joe" pressure regulator for high-pressure field and pipe line installations. Sizes 1" and 2". Reduced pressure range 5 to 200 pounds. Inlet pressure up to 1000 lbs.

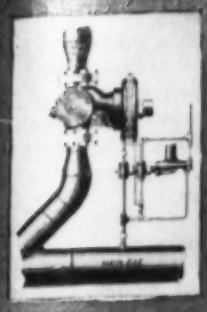


TYPE 298

Pilot-operated gas pressure regulator—non-bleed construction—for border station and district regulator applications, for low and intermediate pressures. Sizes 2" and up.

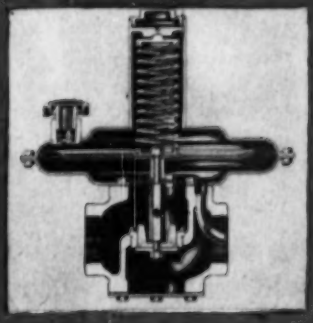
FISHER GOVERNOR C

LEADS THE INDUSTRY IN RESEARCH FO



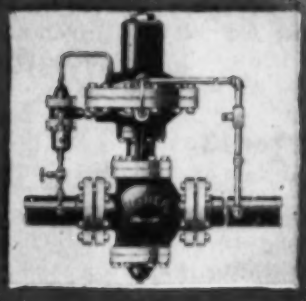
TYPE 29

Full capacity relief valve for distribution systems where large volumes may be discharged without a substantial increase in system pressures. For complete protection against excessive pressures.



TYPE 66

Low-pressure sensitive industrial regulator for inlet pressure up to 5 lbs. Reduced pressure "WC to 1 lb. Sizes 2", 3", and 4".



TYPE 880

High-pressure gas regulator with no bleed to atmosphere, for border stations, loop lines, and big industrials. Extreme stability combined with excellent performance.

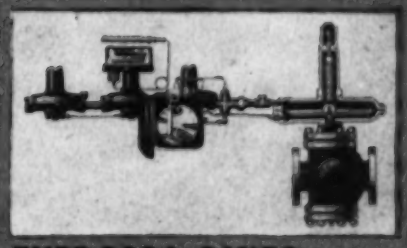
GAS MEN PREFER

's best Gas Regulators

The Industry's Most Complete Line

Fisher Governor Company's wide variety of regulators handle control applications ranging from the natural gas well head to burner utilization. Illustrated are just a few of the varieties of construction.

This complete Fisher line of regulators for the gas industry includes District Regulators, high, low and intermediate pressure — Distribution Regulators — House Service Regulators—High Pressure Field Regulators—Boiler Gas Fuel Governors — Booster Regulators — Safety Shut-Off Regulators—Town Border Station Regulators—Industrial Gas Regulators—Meter Run Regulators.



TYPE 298A-831LTC

As a district regulator the Fisher Time Temperature Booster will automatically increase the low pressure when the temperature drops to compensate for the increased load of residential heating. It automatically lowers the pressure during high-temperature periods.

R COMPANY • Marshalltown, Iowa

FISHER

BETTER GAS PRESSURE CONTROL

Since 1880

oneer Natural Gas Co., "Why Proper Training of Management Personnel"; Paul Kayser, El Paso Natural Gas Co., "The Natural Gas Business and the Electric Business"; Robb M. Winsborough, Middle West Service Co., "People Are Problems."

"Action for Profit" theme of GAMA meeting

Keyed to the theme "Programmed Action for Profit," the 19th annual meeting of the Gas Appliance Manufacturers Association will be held at the Drake hotel in Chicago, May 19-21.

The meeting will feature three general sessions, two meetings of the board of directors, the annual convention dinner, and the president's dinner at which awards will be presented to delegates for meritorious service to the industry.

Among matters to be considered by the board is the proposal of the gas house heating and air conditioning equipment division to divide itself into four separate divisions—furnace, boiler, conversion burner, and recessed heater and floor furnace.

Closing date approaching for achievement award

May 31 is the closing date this year for entries in the AGA distribution achievement award, sponsored by the American Meter Co.

The award gives recognition to the individual who has made an outstanding contribution to the science and art of gas distributing during the current year or for an outstanding contribution which has gained acceptance during the preceding five years. The contribution might consist of a plan, design, program, or any other act that adds to the safety, economy, or service of a distribution system.

NACE's 10th conference attracted more than 1000

More than 1000 corrosion engineers from around the world met in Kansas City on March 15-19 for the 10th annual conference and exhibition of the National Association of Corrosion Engineers. The five-day meet was characterized by a full program of technical meetings and an outstanding display by nearly 100 manufacturers.

This year's meeting completed the reorganization of the association's 19 technical practices committees into six industrial groups. The reorganization program, which was undertaken during the past year, is expected to increase the efficiency and expedite the work of the committees. New rules for the operation of the committees also went into effect with this year's conference. A new technical committee on materials selection for the utilities industry was announced during the session.

Aaron Wachter, Shell Development Co., Emeryville, Calif., was elected president of the association; F. L. Whitney Jr., Monsanto Chemical Co., St. Louis, moved up to vice president; and Russell A. Brannon, Humble Pipe Line Co., Houston, was reelected treasurer for the year 1954-55.

Awards were handed out to Dr. Irving H. Denison, Diamond Ordnance Fuse laboratories, Department of Defense, for achievements in the field of corrosion science and to E. H. Dix Jr., Aluminum Research Laboratories, Aluminum Co. of America, for achievements in corrosion engineering. P. M. Aziz, Aluminum Laboratories Ltd., Kingston, Ont., received the junior award for authors with his paper on pitting corrosion of aluminum.

Aaron Wachter (right) accepts the presidency of the NACE from outgoing president Walter F. Rogers at the recent NACE conference.

A TRIPLE THREAT

to your operating efficiency

Unless this rampaging menace is stopped short of the goal, your engines, your equipment and your entire processing system will remain vulnerable to its attacks.

H_2S can be stopped — dead in its tracks — by America's most effective, most economical, **most proven** gas purification method known today — Connelly IRON SPONGE! Yes, this simple, high-capacity product can be depended upon to cleanse any flow—at high or low pressure—of hazardous Hydrogen Sulphide . . . and also to lower operating and maintenance costs. IRON SPONGE renders this service prolongingly — subject to easy rejuvenation.

Despite its thoroughness and over-all superiority, Connelly IRON SPONGE spreads its low cost thin through each 1000 feet of gas. To get the full facts about this effective purifier, write, wire or phone Connelly — today. Our engineering department is at your service.

PRODUCT OF

CONNELLY, Inc.

3154 S. California Ave., Chicago 8, Illinois
Elizabeth, N. J. • Los Angeles, Calif.

Connelly IRON SPONGE

The Willis Rodney Whitney Award was presented to Irving A. Denison (left) of the Department of Defense by Norton E. Berry, Servel Inc., at the annual banquet of the NACE.

The symposiums on pipeline protective coatings were particularly well attended and developed some of the most active discussions. In some instances the symposium was led off with informal presentations by panel members and in other instances with the presentation of a series of papers. Considerable discussion developed around the comparative merits of the various types of coatings and their application under a variety of situations. New developments in coating materials were also brought out.

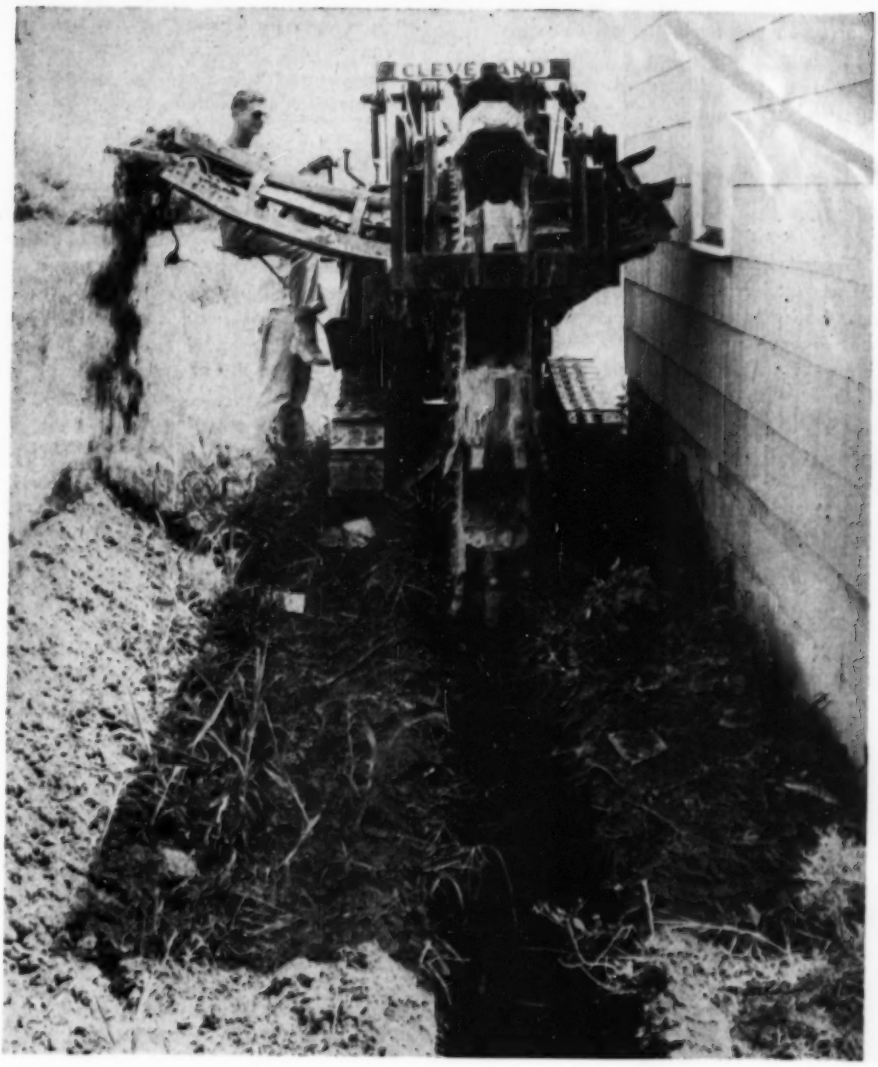
Those meetings related to cathodic protection were also well attended. The matter of fundamental measurements required for practical corrosion investigation was discussed in some detail and led to some new concepts with respect to the measurement of currents developed by stray and local cell action. The matter of interference currents was introduced with a paper on the method for determining the extent of interference that might be expected before the permanent protection is applied. The economic considerations of corrosion control were also discussed as a part of this symposium.

Management level considerations with respect to the costs of corrosion were taken up in a separate session. Industry experience with the costs of corrosion and various means for reducing this loss were shown in detail.

GAMA's industrial group launches ad campaign

To promote recognition of its recently adopted code of ethics seal, the industrial equipment division of GAMA has launched an advertising campaign that will hit a wide variety of trade publications serving the major industries using gas burning equipment in more than 26,000 different processes.

According to Fred C. Schaefer, chairman of the GAMA division, some of the ads will be sponsored by the industrial division, while others will appear over the signatures of individual manufacturer members. The ads will be directed to gas equipment users



20" from Trench to Wall

IN NORFOLK, VA. this Model 92 CLEVELAND "Baby Digger" shows how its useful compactness enables it to place a trench safely within 20" of a house wall. Balanced perfectly on its smooth full crawlers, the 92 maneuvers easily in even the closest quarters, with less damage to lawns, walks and driveways. Because it digs any size of trench from 10 to 20 inches wide and up to 5 feet deep, it is usable on a wide variety of jobs.

The 92 hustles safely from job to job . . . at legal limit speeds . . . because it's so easily portable on the drop-axle, tilt-bed CLEVELAND T5 Trailer.

Write for descriptive literature and specifications or get the full story on CLEVELANDS from your local distributor.

THE CLEVELAND TRENCHER CO.

"Pioneer of the Modern Trencher"

20100 ST. CLAIR AVENUE • CLEVELAND 17, OHIO

involved in processing metals, rubber, textiles, chemicals, plastics, automotive parts and equipment, machinery, paints, and other industrial commodities.

Atlantic City's ballroom set for AGA functions

General sessions, meeting of the residential gas section and the evening entertainment functions of the forthcoming 36th annual convention of the AGA will be held in the Grand Ballroom of the Atlantic City Auditorium. The meeting dates are Oct. 11-13.

Other meetings will be held in Haddon Hall, Traymore, Chalfonte, Claridge, and Dennis hotels. Registration desks will be located in the lobbies of the auditorium, the Traymore, and Haddon Hall.

Association notes

A symposium on instrumentation for industrial hygiene will be presented by the University of Michigan's institute of industrial health and school of public health on May 24-27 in Ann Arbor. The symposium will cover instruments for air velocity, air pollution, sound, ionizing, radiation, air sampling, and analysis. Designed to bring together instrument makers and users of instruments, the three-day session will include exhibits, discussions, and technical papers.

Harrington A. Rose, gas engineer for Stone & Webster Service Corp., has been named secretary of the general management section of the AGA. Bruce A. McCandless has relinquished the post of acting secretary of the section in order to devote full time to his administrative duties as assistant to the managing director.

Paul F. Hoots, assistant to the president of New Orleans Public Service Inc., has been appointed vice-chairman of the AGA rate committee. He will assist George A. Morgan, of Peoples Gas Light & Coke Co. and chairman of the committee, in conducting its operations.

With the transfer of Jac A. Cushman to the AGA public information bureau to help organize a public relations program for the industry, Vaughan O'Brien becomes editor of the *AGA Monthly.* Mr. O'Brien was formerly with the Moore Publishing Co. Mr. Cushman will assist James M. Beall, AGA director of public information, in expanding and coordinating the association's public relations activities.

The closing date this year for the 1954 AGA home service achievement award is July 31. All types of home service activities and new ideas will be considered in the competition—the five prizes of $200 each are available in three divisions. Awards will be presented at the annual convention in Atlantic City in October.

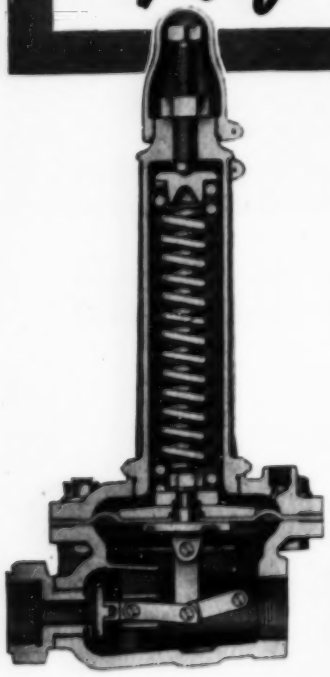
"Home Service Promotion Ideas for Modern Gas Equipment" is the title of a new booklet now in preparation under the direction of the 1954 home service committee. While intended primarily as an aid to home service, sales personnel will find suggestions that they too can use on the sales floor and refer to in customer contact.

Walter H. Kurdelski, sales manager of the Michigan Consolidated Gas Co., Grand Rapids, Mich., has been elected chairman of the residential gas section of the AGA. He succeeds Raymond Leslie, who has become director of sales promotion of GAMA.

The Manufacturers section of the Pacific Coast Gas Association has elected the following members to serve on the nominating committee for 1954: E. S. Todd (chairman), American Appliance Manufacturing Co., Los Angeles; Gordon L. Payne, Payne-Beverly Manufacturing Co., Beverly Hills; and A. A. Jacquot, Detroit-Brass & Malleable Works, Los Angeles.

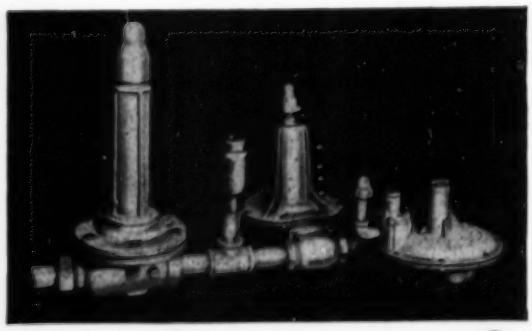
A San Francisco Bay area chapter has been organized by the California Natural Gasoline Association, joining the Ventura, Taft, and the Los Angeles basin chapters. S. A. Haavik, Pacific Gas & Electric Co., and Joseph R. Rensch, Coast Counties Gas & Electric Co., are among the members of the steering committee.

IN THE HIGH PRESSURE FIELD
THERE IS SAFETY
IN Reynolds...



Accurate, Safe Control

of tremendous pressures is an ever present problem in the gas field. Reynolds field Regulator illustrated at left is one of the many high pressure regulators built by Reynolds. It is thoroughly tested and proved in service. It handles up to 1,000 pounds safely reducing same to pounds. For more than fifty-five years Reynolds has designed and built gas regulators. Safety, accurate performance, years of service—these are some of the built-in factors responsible for Reynolds enviable position in the Gas Control Field.



Reynolds Gas Regulator Co.
ANDERSON, INDIANA, U. S. A.
GAS CONTROL SINCE 1892

NEWS

Colorado municipal league to investigate rate hike

The Colorado Municipal League plans to raise a $40,000 war chest to finance a line-by-line inspection of the petition filed by the Public Service Co. of Colorado for an increase in electric and steam service rates. When the company asked for the state PUC to set a fair rate of return on its steam and electric services, it hinted that it may be forced later to require gas service increases also.

Mayor Newton of Denver, in explaining the league action said, "We wouldn't be in this at all if we felt the Colorado PUC was sufficiently staffed to give responsible attention to the rate petition. The league feels that it has certain, definite obligations to act as a protective third party."

He also said that the league previously had contended that the state legislature had failed to equip the PUC to handle the greatly increased authorities it has gained in the last several years.

Dresser plans expansion program in Tulsa area

The signing of a purchase agreement with Industrial Sites Inc., of Tulsa, covering approximately 15 acres located in the New Sheridan industrial district of Tulsa, has cleared the way for further expansion by Dresser Industries Inc., Dallas, in the Tulsa area. The long-range program will involve an ultimate capital expenditure of more than a million dollars.

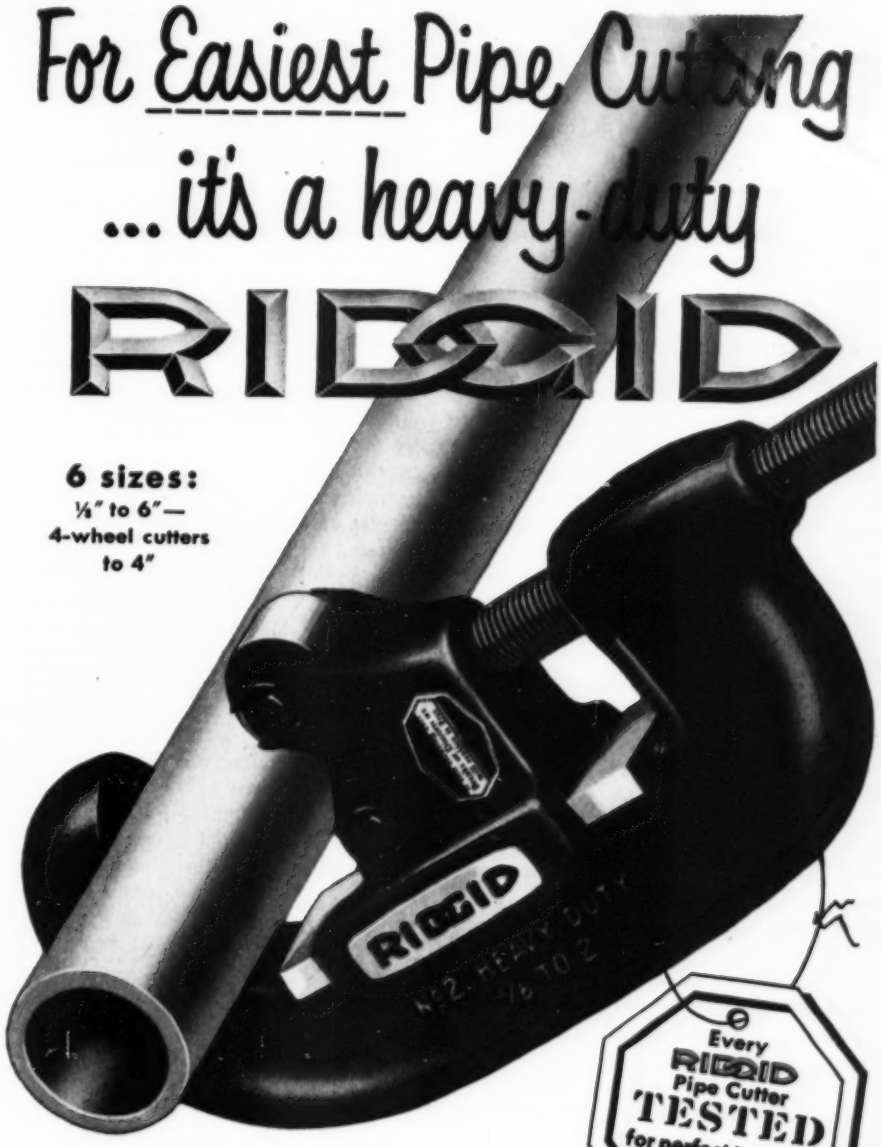
While final plans will be developed to fit the Dresser companies' eventual needs, the immediate program calls for the construction of a modern brick office building and a warehouse. Clark Bros., of Olean, N. Y., one of the largest Dresser operating companies, will move from its present Tulsa location into the new quarters early this summer. Regional sales and service engineering offices and warehousing, together with a complete parts depot, will be set up by Clark.

As soon as present lease commitments expire, other Dresser subsidiaries will be relocated at the new Tulsa site. Dresser's overall, long-range plans include the eventual construction of additional service, warehouse and office space in three more units comparable to the original Clark building. Dresser also plans to locate manufacturing facilities on this site, which may eventually occupy a total area of several hundred thousand square feet.

Competitive bidding sale of Gas Service okayed

The Missouri Public Service Co., Warrensburg, Mo., has withdrawn its new proposal to buy the Gas Service Co. of Kansas

For Easiest Pipe Cutting ...it's a heavy-duty RIDGID



6 sizes: ⅛" to 6"— 4-wheel cutters to 4"

Every RIDGID Pipe Cutter TESTED for perfect tracking before shipment

You cut more pipe with less work with a RIDGID

Once you've put a RIDGID Cutter on a pipe and seen how easily and cleanly it rolls through the metal, you won't want any other kind. Smartly balanced for easy action. Tracks perfectly—and special malleable housing, guaranteed warp-proof, keeps it that way. High alloy thin-blade or heavy-duty cutter wheels, practically no burr. For fast cutting with least effort, ask your Supply House for a RIDGID.

THE RIDGE TOOL COMPANY • ELYRIA, OHIO, U. S. A.

RIDGID
Work-Saver Pipe Tools

City, and Cities Service Gas Co. has received SEC permission to sell its subsidiary at competitive bidding.

This means that the 1½ million shares of $10 par value common stock in Gas Service will be sold to the public and not to a utility. The bidding papers filed by Cities Service with the SEC specified that the stock be sold to the best bidder who will make a public offering. Under these terms, no utility can qualify.

Five-year accident-free period set by ConEd crew

The drama behind accident statistics has been responsible for the newly established record of five years without a lost-time accident set by the holder maintenance and painting bureau of Consolidated Edison Co. of New York.

In 1949 the previous five-year record showed about 39 lost-time accidents averaging around 23 days—some serious bruises, a crushed hand, several broken legs, one death. By choosing to think of the anguish instead of the statistics, the 300 painters, riggers, demolition, construction, and tool room mechanics set new man-hour and longevity records for Con Edison's other outside groups to shoot at.

In Dallas, Lone Star Gas Co. was among 17 companies receiving awards in three special safety categories presented by the Texas Safety Association. The company received safety honors for its natural gasoline plants, gas pipelines, gas utilities transmission, and gas utilities distribution.

Another notable safety achievement in the industry is that of the engineering division of the distribution department of the Philadelphia (Pa.) Gas Works. The division, with a group of 45 to 50 men working about 100,000 man-hours per year, has been six years without a lost-time accident.

Gas air conditioning's low cost favorite feature

All-year gas air conditioning for homes is favored by homemakers mainly because of its low operating cost, among other advantages, according to a survey conducted by the AGA.

Survey results were derived from interviews with 325 homemakers, constituting a representative sample of residential air conditioning installations throughout the country, except the southeast. The study, initiated by the AGA gas all-year air conditioning committee, was conducted by the home service committee, which utilized a survey form prepared by Servel Inc.

Two-thirds of homemakers interviewed felt air conditioning was essential, while most of the remainder deemed it desirable. The survey disclosed that women who once refused to have it changed their minds after they had enjoyed its many conveniences and healthful features in their own homes.

Since air conditioning their homes, general health of their families was improved, said two-thirds of those interviewed; more than one-fifth said doctor and medical bills had decreased; and less cleaning work was required according to four-fifths.

Interviews were limited to homemakers whose residences had all-year air conditioners. Generally, these conditions prevailed: (1) Homemakers, who had air conditioners more than one year, reported more benefits than those who had them for less time; (2) families with children reported more health benefits than childless families; (3) advantages reported were equally prevalent throughout the country; (4) most homemakers reported that some benefits were enjoyed by the family, although rarely were all benefits enjoyed by the same family.

Survey results will be distributed to all association member companies so that they may use the information to develop programs and materials and promoting air conditioning for homes by primarily interesting women.

LPG has key role in civil defense plans

The L. P. gas industry has been assigned a key role in federal civil defense plans in case of atomic attack.

Recognition of L. P. gas dependability and portability was achieved in a series of demonstrations for defense officials by C. J. McAllister, vice president and general manager, The Parlett Gas Co., Waldorf, Md., and a representative of the LPGA on the national advisory committee on emergency feeding.

He showed how emergency cooking, heating, water heating, refrigeration and lighting could be set up if large city utility service was disrupted by enemy attack. The six civil defense officials present at the demonstrations were particularly interested in the adaptability of L. P. gas to any stove or emergency burner.

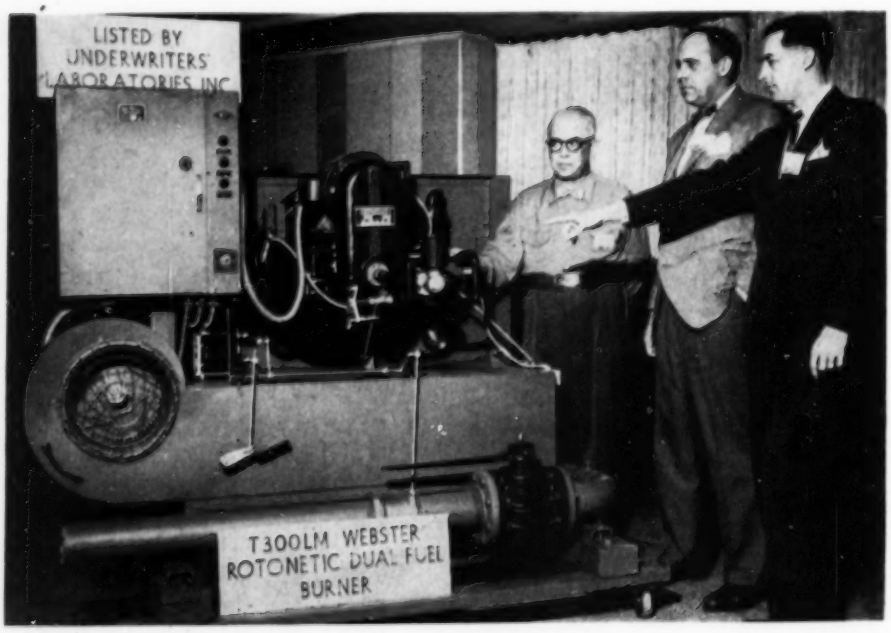
At the meeting, Mr. McAllister also outlined plans for calling on experienced L. P. gas company personnel to make emergency installations in hospitals, churches, and schools for mass feeding and housing. He pointed out that industry facilities are widespread throughout the United States so a nationwide LPG service network could be alerted.

Civil defense authorities have planned to use crude ovens and water heaters, burning debris and rubble as fuel. In addition, they have accepted L. P. gas, because of the handy portability of L. P. gas cylinders and the size of the industry, Mr. McAllister advises.

Mr. McAllister put on a second demonstration at the Staff College Civil Defense Training Center at Olney, Md., to show the flexibility of L. P. gas for mass feeding as part of an extensive five-day course for the American Legion Auxiliary conference.

John J. Hurley, of the Civil Defense Administration, describes his staff's search for efficient and suitable means of cooking to supplement the crudeness of bricks, drums and other debris for cooking tools. Because of the versatility and serviceability of L. P. gas, they decided that it would serve the purpose as an alternative fuel.

Mr. McAllister showed how LPG appliances could provide energy and heat with speed and efficiency, using a variety of appliances and equipment. Starting with a display of 5-lb, 20-lb, and 100-lb cylinders, he explained the equivalent of each container in heat and energy compared with electricity and natural gas.



This new rotonetic dual-fuel burner was exhibited at a recent conference at Webster Engineering Co. in Tulsa. Taking a look are (l to r) L. S. Reagan, Webster vice president and general manager; George Bergtholdt and K. Scott Jaeger. The new burner is designed to fire large commercial and industrial boilers.

Two different types of plumbers' pots used with 20-lb cylinders were demonstrated. Emphasizing the practicality of L. P. gas service in case of enemy attack, such units might be used in national emergency for cooking, heating water and sterilizing instruments.

A compact sportsman's stove attached to a 20-lb cylinders was also demonstrated. For heavy-duty purposes, Mr. McAllister used half of an oil drum improvised as a king-size vessel for mass feeding on a utility stove. He explained that its high input burners would not be affected even in open wind.

In addition to showing the uses of a baker's stove and institutional type hot plates, Mrs. McAllister showed how quickly a city gas range could be converted to LPG.

As a result of the effectiveness of the display specifications for cooking and heating equipment are being developed that will use LPG in civil defense feeding and hospital operations. "These specifications will be included in the material recommended for stockpiling under our contributions program," said Mr. Hurley.

A major development resulting from the acceptance of LPG by the Civil Defense Administration is an important CDA petition to the Federal Communications Commission in which defense officials object to a proposed FCC rule that would restrict two-way radio communications to metropolitan areas of less than 50,000 population. The rule would seriously cripple L. P. gas delivery systems and hamper the industry's efforts to be of service in a possible emergency.

Utility executives to judge Rockwell's meter contest

Five gas and electric utility company executives have been chosen as judges in a $5000 essay contest being sponsored by Rockwell Manufacturing Co. for persons employed in the gas industry.

The five are: D. A. Hulcy, president, Lone Star Gas Co., Dallas; F. A. Lydecker, vice president of gas operations, Public Service Electric & Gas Co., Newark, N. J.; H. L. Masser, executive vice president, Southern California Gas Co., Los Angeles; William G. Rogers, president, the East Ohio Gas Co., Cleveland; and H. Carl Wolf, managing director, American Gas Association, New York.

The nation-wide contest, which is on the general subject of planned meter retirement programs in the industry, provides prizes totaling more than $5000 worth of Delta power tools to winners in two categories:

1. For an essay not exceeding 2000 words in length on the subject "The Economies of a Planned Meter Retirement Program."

2. For adding the last line of a jingle on the same theme.

First, second and third place winners of the essay contest will receive, respectively, a complete shop of Delta industrial-type power tools and accessories valued at $1750, a complete shop of Delta Homecraft power tools worth more than $1100, and four awards each consisting of a $386 Deltashop and accessories.

Jingle contest winners will receive a Deltashop four-in-one combination power tool and accessories for first place, a $207 Delta saw and jointer combination for second, and a $172 Delta 11-in. drill press and accessories for third.

Michigan city loses battle with MichCon over rates

A Michigan Public Service Commission order has given Michigan Consolidated Gas Co. permission to increase its rates in Mt. Pleasant by $245,000 a year, despite Mt. Pleasant's contention that only its city commission can approve rates, citing a 1931 agreement with Consolidated.

The commission ruled that Michigan Consolidated may put into effect immediately in Mt. Pleasant the same rates for gas as it now charges customers in Big Rapids, Clare, and Rosebush. It is expected that the city will appeal the case to the State Supreme Court.

The commission said Michigan Consolidated loses 18 cents on every 1 Mcf of gas it sells in Mt. Pleasant. "If the rates within Mt. Pleasant had been in effect on Consolidated's whole system, Consolidated would be

Insist on...

PROTECTO WRAP

Cold Coating

FOR COATING AND WRAPPING UNDERGROUND OIL AND GAS PIPELINES-

Protecto Wrap Cold Coating provides hot applied enamel quality of material and workmanship on oil and gas pipelines. It is particularly recommended for reconditioning, and for field joints and repairs to coating.

Protecto Wrap Cold Coating is applied in two steps with the following described materials — either asphalt or cold tar base depending upon adjacent coatings.

1. Protecto Wrap Cold Coating Primer consists of a heavy bodied bituminous coating that is applied by conventional brushing. Care should be taken to thoroughly fill all pits on reconditioned pipe with primer.

2. Protecto Wrap Cold Coating consists of a woven glass textile cloth saturated with asphalt or coal tar pipeline enamel. This coating is applied by spiral wrapping over the primer while it is still wet.

Our sales representatives are available to demonstrate this material and method. Address orders or inquiries to our nearest sales office or to P. O. Box 82, Englewood, Colorado.

1406 JEFFERSON AVENUE
HOUSTON, TEXAS
212 PRUDENTIAL BUILDING
PASADENA, CALIFORNIA
822 THOMPSON BUILDING
TULSA, OKLAHOMA
P. O. BOX 33
KENILWORTH, NEW JERSEY
Room 800, 20 E. JACKSON BLVD.
CHICAGO, ILLINOIS

PROTECTO WRAP COMPANY
ENGLEWOOD, COLORADO

operating at a deficit of approximately $13 million per year," the commission order said.

Coast Counties Gas wins national honor for ads

Coast Counties Gas & Electric Co. was awarded national recognition recently for the excellence of its advertising during the past year. At a luncheon held in the company's honor in San Francisco, officials of Coast Counties and its advertising agency, the McCarty Co., were presented with plaques representing first prize nationally in the local outdoor advertising awards contest, sponsored annually by the Outdoor Advertising Association of America.

The company was honored for its "Go Modern—Use Gas" series of 24 sheet outdoor posters.

The above billboard helped Coast Counties Gas & Electric Co., San Francisco, win first award in the continuous poster division.

R. L. Hayden (left), Coast Counties vice president, receives the first award and congratulations from C. R. Leach, of Foster & Kleiser Outdoor Advertising Co., in the national contest for the continuous poster advertising division.

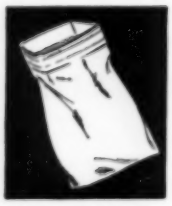
Reduction in prices coming from excise tax cut

With the cut in excise tax on household appliances, manufacturers have commenced reducing their prices. Servel announced reductions of as much as $50 in the suggested retail price of its gas refrigerators.

By cutting in half the 10% tax on such appliances as refrigerators, ranges, ironers, and dryers, revenues are expected to amount to $100 million annually. Senators Paul Douglas of Illinois, Walter George of Georgia, and other Democrats originally led the drive to abolish the excise tax entirely on the household appliances. Senator Capehart of Indiana said he and some other Republicans were under heavy pressure from appliance manufacturers all over the country to give them some relief.

CALORIC GAS DRYER

with NEW NYLON "SIFTO-BAG"



Exclusively for Gas!

Caloric GAS Dryers are easier to sell, because they're promoted by a company that believes in aggressively advertising and selling gas equipment.

And Caloric GAS Dryers are easy to install and service, because they're designed and built by a company that specializes in gas appliances exclusively.

The new nylon "Sifto-Bag" is a good example of how Caloric builds salable features. It's located waist-high in the front of the dryer where it's easy to use. It's the most efficient lint trap in existence. It's an important improvement in dryers. And it's exclusive with Caloric.

Only Caloric GAS Dryers offer all these features:

LO-HEET . . . HI-BREEZE . . . the exclusive principle that speeds up drying, fluffs up wash, cuts down costs.

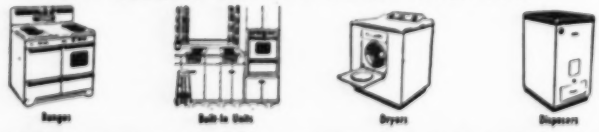
All working parts easily accessible. Controls quickly reached by removing top housing or front panel. All servicing done from top and front.

One-knob control lights burner and starts dryer. Completely automatic operation.

High-level air intake. Sturdy drop-door for easy loading and unloading. Three choices of moisture exhaust.

Feature Caloric Gas dryers, and "You'll sell more . . . in fifty-four!"

ONLY CALORIC DOES SO MUCH WITH GAS!



CALORIC

CALORIC STOVE CORPORATION, TOPTON, PENNSYLVANIA

100th year celebrated by Roots-Connersille

R. R. Newquist heads the firm

Roots-Connersville Blower, a division of Dresser Industries Inc., is celebrating this year the 100th anniversary of the discovery by the Roots brothers, Francis and Philander, of a principle for creating positive mass movement of gas and air that has remained basically unchanged since 1854. It was in that year that the first Roots industrial blower was made.

Forty years of operation without a breakdown has become commonplace. One blower has been operating for 78 years. It is supplying air for a New Jersey mineral wool plant; installation date, 1876.

In Cleveland, Ohio, a battery of new blowers is being installed at the municipal sewage disposal plant. They will be placed side by side with another battery of Roots blowers that was installed in 1914 and is still in full-scale operation.

While searching for a more efficient means to power their woolen mill, the Roots brothers tried to improve on the overshot water wheel in use.

Although the machine they devised was judged a complete failure as a water motor, they noticed that a constant stream of air issued when the paddles, or impellers, were set in motion. They tried it as a blast blower in a foundry cupola. The idea was a success, providing more complete combustion than had ever been achieved.

Now, in addition to the rotary positive blower, the company makes centrifugal blowers and exhausters, positive displacement meters, vacuum pumps, inert gas generators, and its latest, a Spiraxial compressor.

Coast Counties Gas files rate reduction request

Coast Counties Gas & Electric Co. has filed a reduction in its gas rates with the California Public Utilities Commission that will amount to $166,480 of estimated annual gas revenue.

The new rates, which were to be effective April 1, are in line with the company's agreement incorporated in the recent gas rate increase decision of the PUC, which provided for such downward adjustment in the event that the federal income tax rate was reduced from 52% to 47% on April 1.

Company spokesmen pointed out that Congress could act at any time during 1954 to increase the income tax rate and, if this were done, Coast Counties would file a supplemental application for new rates to reflect such tax change as provided for by the terms of the original agreement.

News Notes

Two new distributors have been appointed by Servel Inc., Evansville, Ind. Raytheon Distributors Inc., Philadelphia, will distribute Servel refrigerators, home freezers and room air conditioners in parts of Pennsylvania, New Jersey, and Delaware. Cain & Bultman Inc., Jacksonville, Fla., will distribute all Servel appliances in southern and southeastern Georgia and the northern part of Florida.

New distributors have been appointed by Hamilton Manufacturing Co., Two Rivers, Wis. Davis Distributing Co. of Norfolk, Va., is the distributor for the complete Hamilton line in the Tidewater area of Virginia; Standard Distributing Co. is the new San Antonio (Texas) distributor.

The Republic Steel Corp. has appointed the Republic Supply Co. of California, which is an independent western concern, as a west coast distributor for its oil country tubular goods and line pipe.

Southern Counties Gas Co. recently commemorated 38 years of growth of the communities in the Santa Monica Bay area when it installed the 100,000th gas meter in the area. Southern Counties purchased the gas properties in Santa Monica in 1916 when there were less than 10,000 meters on the

CALORIC GAS RANGES

with Dione Lucas PROMOTION

Exclusively for Gas!

Manufacturing exclusively for the gas industry, Caloric is, has been, and will continue to be a leader in promoting gas ranges and gas appliances.

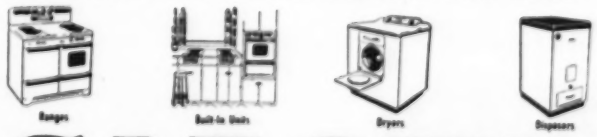
For instance, Caloric offers Gas Companies the Dione Lucas gas-cooking TV show. This half-hour program is now helping more than 55 Gas Companies to sell more gas appliances.

Caloric makes a complete line of *modern* gas ranges with *exclusive* features such as colored, detachable door handles; air-cooled sides; "HI-LO" broiling pan; one-piece cast-iron Tri-Set burner with dual throats; removable broiler door; easily removed insulated oven bottom; oven-door spring guaranteed for life.

For easy cleaning, porcelain enamel grates lift off and one-piece burners can be quickly lifted out. The entire broiler can be removed for at-the-sink cleaning, as can oven bottom, non-tilting oven racks, toe plate, manifold panel, handles and control knobs.

Caloric ranges are America's easiest ranges to keep clean. And America's easiest ranges to sell and service.

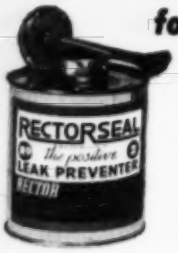
ONLY GAS DOES SO MANY THINGS . . . SO WELL!



CALORIC

CALORIC STOVE CORPORATION, TOPTON, PENNSYLVANIA

THERE'S NO SEAL LIKE RECTORSEAL



for • high quality
• low price
• service
• leak-proof sealing

Use Rectorseal #2 on threaded connections in service lines, meter loops, appliance connections, swing joints, and all others on lines carrying natural or manufactured gas. It holds odorants, too! Compare Rectorseal #2 quality and price with any other thread compound, and you'll see why so many utilities are changing to this dependable, positive, economical, leak-proof thread sealing compound.

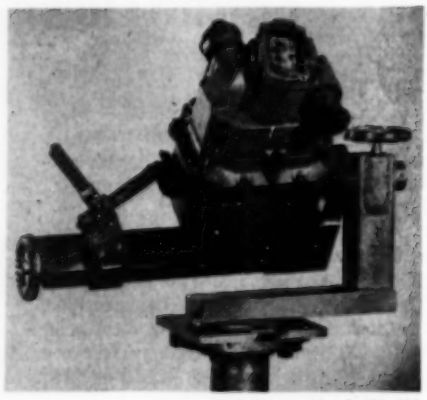
Your supply house has it or can get it for you.

We will send you a generous sample free. Write for it today.

RECTORSEAL, Dept. "B"
2215 Commerce St. Houston 2, Texas

RECTORSEAL # 2
MAKING THE GAS INDUSTRY SAFER

UNIVERSAL
METER REPAIR RACK



U.S. Patent No. 2,621,400

A practical, time-saving fixture that allows operator both hands free to repair meter. After locking, the meter is rigidly held and may be instantly rotated in both vertical and horizontal planes. Suitable for bench or pipe pedestal mounting. For all iron case meters in domestic sizes and of Rockwell, Sprague or Metric manufacture. Send for complete information.

UNIVERSAL
CONTROLS CORPORATION
731 WEST DAVIS STREET • DALLAS 8, TEXAS

lines, representing a population of about 30,000. Today, with 100,000 meter installations, there is a population of 350,000.

The scattered units of its gas meter division are being consolidated by the Public Service Electric & Gas Co., Newark, N. J., in a large new plant in Springfield, N. J. The new structure contains about 77,000 sq ft of air-conditioned working space.

The Gas Institute of Greater Miami and its 20 member gas companies have adopted the advertising character, Handy Flame, and will use it to add interest and continuity to its entire advertising and sales promotion program.

To provide centralized sales and service facilities for Consolidated Engineering Corp. instrument users in the industrial southeast, CEC Instruments Inc., a subsidiary, has transferred its southeastern regional offices from Washington, D. C., to Atlanta, Ga.

A bronze Joshua plaque has been awarded Citizens Utilities Co., Greenwich, Conn., for the most distinguished use of matchbook advertising in the utilities industry in 1953. The award is made by the Match Industry Information Bureau. Consolidated Edison Co. of New York was awarded a certificate.

With an affirmative vote from its stockholders, American Car & Foundry Co., a name for 55 years prominently identified with the manufacture of freight cars, will change its name to ACF Industries Inc. AC&F bases its proposed change in name on its growing emphasis on production in other fields, such as the manufacture of equipment for the gas industry.

Vulcan Rubber Products Co. has appointed West American Sales Co., Los Angeles, as California representative for Vulcan's gas meter diaphragms, industrial coated fabrics, and a new waterproof Coverlight fabric.

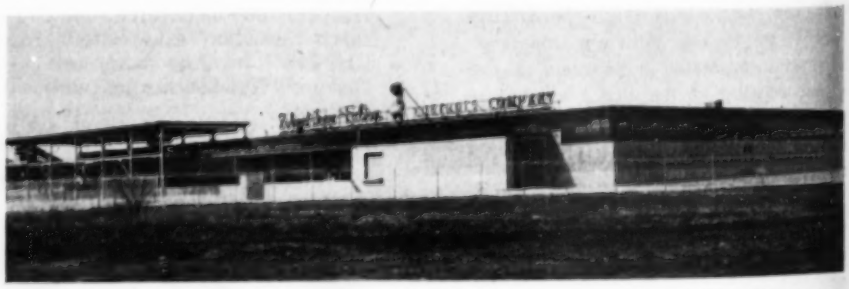
The Selas Corp. of America, Philadelphia, has been chosen to build eight radiant-heat furnaces for the new Gulf Oil ethylene plant at Port Arthur, Texas, which Gulf spokesmen say will have the world's largest ethylene producing capacity, estimated at 7 billion cu ft annually. Ethylene gas, the sole raw ingredient of the new polyethylene plastic industry, is produced at Port Arthur from components of ethane, propane and ethane-propane.

A symposium on "Current Legal Problems of the Natural Gas Industry" will be held at the Hotel Statler in New York on June 7-11 under the sponsorship of the Practising Law Institute in cooperation with the AGA. Business problems connected with securing field supplies of gas, gas supply, certificate proceedings, rate problems, etc., will be discussed. Additional information is available from the institute, 20 Vesey St., New York 7.

A Fort Worth (Texas) district court judge has ruled that he has no jurisdiction to review the wisdom or correctness of a recent rate increase granted Lone Star Gas Co. by the city council. The suit contended that the council action was illegal because it was based on a false claim of need and that the company distorted its true financial picture. "This court has no jurisdiction of an appeal where the matter complained of is merely one of judgment, fact-finding, or procedure," the judge said.

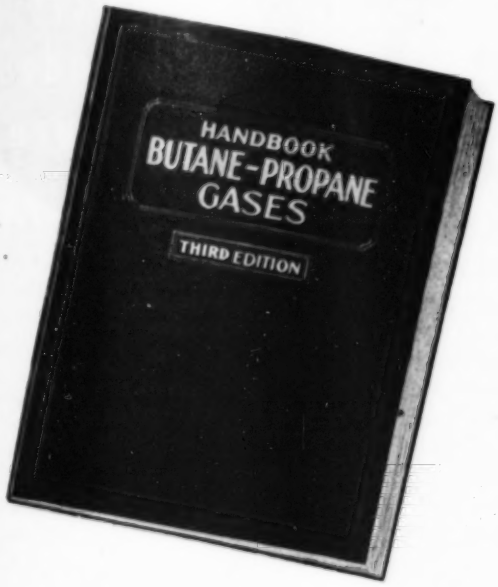
Citizens Gas &Coke Utility, Indianapolis, will close its Langsdale plant in an economy move to concentrate coke-gas production at its Prospect plant. Reasons for closing the plant are (1) softening of the coke market due to steel production cutbacks, and (2) poor condition of Langsdale coke ovens (built in 1912). The move will put the utility in a better position to regulate production, shrink indirect costs of manufacturing operations, and provide critically needed space for the expansion of the distribution facilities.

Total utility and pipeline gas sales to ultimate consumers in February 1954 totaled 6185 million therms, the AGA reports. Sales for the month were 10.3% higher than the 5610 million therms sold in February 1953. Natural gas sales in February 1954 aggregated 5792 million therms, up 10.4% over the 5244 million therms sold in February 1953. Manufactured and mixed gas sales totaled 393 million therms, a gain of 7.6% over 365 million therms a year earlier.



New plant of Robertshaw-Fulton Controls Co. at Indiana, Pa. The $175,000 one-story building containing 70,000 sq ft will be used for the manufacture of certain new products now being readied for the market.

The Only Complete Reference Book on Liquefied Gas Engineering, Installation and Operation



352 PAGES of Technical Facts, Charts, Diagrams, Photographs, Including Latest Processes and Materials.

CONTENTS

PART 1. Introduction
The Progress of the Industry
The ABC of L. P. Gas

PART 2. Physical and Chemical Properties
Properties of the Hydrocarbons in L. P. Gas
Properties of Butane-Propane Mixtures
Volume Correction Factors
Analytical Determination and Testing
Fire Protection and Control

PART 3. Production of L. P. Gas
Natural Gasoline Plants, Recycling Plants, Oil Refineries

PART 4. Transportation and Storage
Delivery by Truck, Rail, Water, and Pipe Line
Storage Tank and Pressure Vessel Design
Liquid Metering and Pumping Systems

PART 5. Distribution of L. P. Gas
Installing and Servicing L. P. Gas Systems
Semi-Bulk Systems
Bottled Gas Systems
Gas Utility Service from Central Plants
Multiple Utility Service from a Central Plant

PART 6. Utilization of L. P. Gas
Comparative Performance With Other Fuels
Appliance Installations and Testing
Domestic Applications
Commercial Applications
Industrial Applications
Enrichment, Peak Load, and Standby Uses
A Fuel for Internal Combustion Engines

PART 7. Regulations
N.B.F.U. Pamphlet No. 58
Motor Carrier Tariff No. 7
Freight Tariff No. 4
Unloading from Railroad Tank Cars
Marine Regulations

PART 8. Appendix
Interchangeability of Other Fuel Gases with Natural Gas
L. P. Gas Insurance
Handy Tables for Field Use
Regulators
Flame Weeding
Bibliography
Glossary of Terms
General Index
Table and Chart Index

$7.50 Per Copy

We pay postage on orders accompanied by check or money order. In California add 23¢ for sales tax.

Orders from individuals must be accompanied by amount of purchase unless credit has been established.

SEND ORDER TO GAS

198 South Alvarado St. Los Angeles 57, Calif.

READ WHAT THEY SAY ABOUT Tri-Line CONCRETE CUTTERS

"For the past three seasons we have used your Tri-Line Cutter for sawing contraction joints in concrete pavements in highway and airport construction . ... The Tri-Line Cutter has proved to be a sturdy dependable machine, particularly adapted to cutting long runs of longitudinal contraction joint."

KOSS CONSTRUCTION CO.
Des Moines, Iowa

"We have been using a Tri-Line Saw for almost one year and we are thoroughly satisfied with its performance. We use it extensively in cutting for machine foundations, utility lines and general concrete floor repairs. This practice has proved very successful . . ."

WOLVERINE TUBE DIVISION
Calumet & Hecla Consolidated Cooper Company Incorporated
Decatur, Alabama

ASK FOR FREE DEMONSTRATION... PROVE Tri-Line BEST BY ACTUAL TEST

Contractors, street and highway department officials, public utilities, and others concerned with the construction and maintenance of concrete pavement are discovering new savings in labor and materials by sawing with Tri-Line Concrete Cutters. They are amazed at the ease of handling, the speed of cutting — pleased with the full 30 gallon water supply and the three-wheel (non-tilting) undercarriage that assures longer blade life and lower cutting costs — convinced by the many engineered features which prove Tri-Line is "Best by Test". Prove it to yourself — we will be pleased to arrange a Tri-Line demonstration on any job without obligation.

Write for **FREE** Illustrated Brochure

Complete specifications, construction details, and the name of your nearest Tri-Line Dealer will be sent upon request.

TRI-LINE COMPANY

Dept. 971 **Racine, Wisconsin**

DEALER INQUIRIES INVITED

DITCH WITCH

WORLD'S BEST
SMALL
TRENCHER

LOWEST COST
TRENCHING FOR
PUBLIC UTILITY WORK

Manufactured
Under
Patents Pending

Digs 3" to 6"
Trenches Any Depth to 36"

For low-cost general light trenching. Self-contained, operates under its own power. Digs clean, even trenches to 36" depth. Lightweight, mobile, low operating and maintenance costs. Easily transported from job to job. Several models.

PROVEN IN ALL SOILS

DITCH-WITCH TRENCHERS pay for themselves in a few days.

Write for Illustrated Literature

THE CHARLES MACHINE WORKS
626 B STREET • PERRY, OKLAHOMA

WARRENGAS
A LIQUEFIED PETROLEUM GAS OF HIGHEST QUALITY

WARREN
PETROLEUM CORPORATION
LIQUEFIED PETROLEUM GAS DIVISION
TULSA, OKLAHOMA

SALES OFFICES:
FORT WORTH, TEXAS
HOUSTON, TEXAS
LOUISVILLE, KENTUCKY
MADISON, WISCONSIN
MIDLAND, TEXAS
MOBILE, ALABAMA
ST. LOUIS, MISSOURI
NEW YORK, NEW YORK
OMAHA, NEBRASKA
COLUMBIA, SOUTH CAROLINA

CLIP THIS AND MAIL TODAY

IF YOU ARE NOT A
REGULAR SUBSCRIBER TO GAS

In GAS each month you will find dozens of ideas that will help you know your business better and do your job better. Just one of these ideas coming to you on our pages can pay you many, many times the small cost of a subscription.

GAS 198 SOUTH ALVARADO ST.
LOS ANGELES 57, CALIFORNIA

Standard rates apply to U. S. and Possessions.
ALL OTHER COUNTRIES
1 Year $4.00 ☐
2 Years $7.00 ☐

Please enter my subscription to GAS for . . .

1 YEAR $2.00 ☐ 2 YEARS $3.00 ☐

☐ Check is enclosed ☐ Please bill me

COMPANY_____

NAME_____ POSITION_____

STREET CITY ZONE STATE

New Products and Trade Literature

To secure further information on products or new literature, simply fill out the coupon on page 102 and mail, indicating by number the information or literature needed.

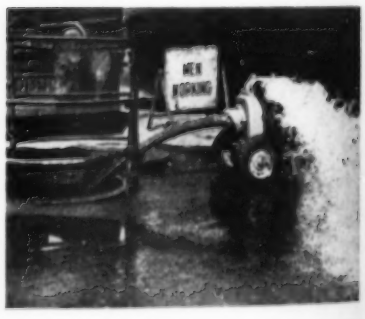
1 Valve Box Locator

A copper-shielding type of inner construction that semi-encloses the needle swing area of the instrument has been incorporated in the Aqua valve box locator, according to the Aqua Survey & Instrument Co.

The construction sets up a series of magnetic fields that act as brakes on the swing of the needle. The result, according to company engineers, is an absolute minimum of needle swing, which means speedier and more accurate location of missing valves, valve boxes, etc. The improved instrument has been exhaustively tested under actual working conditions.

Aqua Survey & Instrument Co.

■



2 Water Pump

A new high-performance pump, Model 2PN Jaeger Super Prime, actually pumps all the water that can be pulled through a

2-in. suction line under average pumping conditions. It delivers its rated capacity of 10,000 gph when operating at the low speeds of 2400 to 2550 rpm.

Other features incorporated in the light and compact pump are combined inherent and jet priming, a self-cleaning shell of 20% steel, positively lubricated shaft seal, reversible liner plate, and an impeller that is adjustable for wear.

Jaeger Machine Co.

■

3 Temperature Controller

The Fielden Instrument division of Robertshaw-Fulton Controls Co. has introduced a new two-zone electronic temperature controller designed for a wide range of industrial applications.

The Series 97 electronic temperature controller uses a resistance temperature detector element as a sensing device in a bridge circuit in conjunction with a high-gain phase sensitive amplifier relay unit.

A single dial sets the temperature control point, and red and green lights indicate whether the temperature is above or below the set point. The single-pole two-way control contact will handle 220 volts at 5 amps. Standard ranges are zero to 100°, 300° or 500° F and C. Sensitivity is 0.25° F on all ranges. Only two vacuum tubes are employed and the unit is encased in a cast aluminum housing.

Robertshaw-Fulton Controls Co.

■

4 Pipe Finder

A new electronic pipe finder from Fisher Research Laboratory features greatly improved operational and over-all field performance for locating and tracing buried pipes, conduits, and metal objects. A completely new electronic circuit is used as well as new and more durable interior and exterior components.

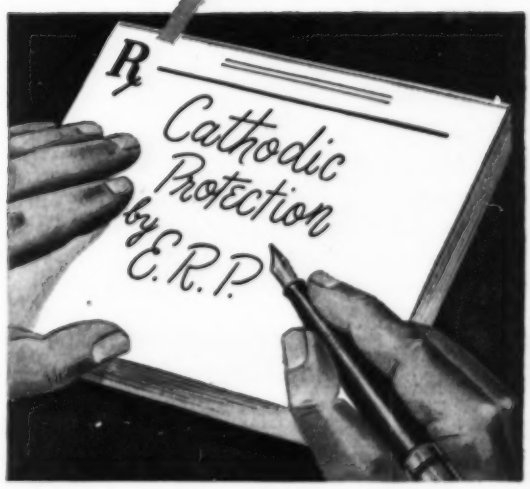
The instrument cabinets are red molded fiberglass that is practically indestructible, is impervious to water, and will not scratch, stain, splinter, or bend.

The conventional-wound multi-turn antenna loops and beat oscillator-type circuit have been eliminated. The new circuit is highly stable for all field applications and is insensitive to temperature changes and the shock and vibration of rugged every-day field use. The "B" battery consumption has been greatly reduced so that they will last about three times as long as they did formerly. The "A" batteries will last fully twice as long.

The receiver selectivity and the instrument operational frequency combine to make the new Electronic Witch much less sensitive to all types of outside interference, and particularly that associated with neon signs and overhead power lines. Further, the circuit design employs readily replaceable components.

℞

FOR CORROSION...



You don't need a specialist to *recognize* Corrosion. But you do need one to treat it successfully. The skill required to achieve complete corrosion control comes only from the knowledge and experience gained through years of practical application.

Recognition of that fact is one reason more and more people are turning to E.R.P. for assistance on corrosion problems — one reason that thousands of buried or submerged steel structures of all types have been successfully protected against corrosion by E.R.P. engineers. Corrosion specialists *for over 17 years*, these men are highly trained and well equipped to help you with *your* corrosion problem. Write for full information today.

COMPLETE CATHODIC PROTECTION SERVICE • DESIGN ENGINEERING MAINTENANCE INSTALLATION EQUIPMENT

ELECTRO RUST-PROOFING CORP. (N. J.)

BELLEVILLE 9, NEW JERSEY

REPRESENTED IN PRINCIPAL CITIES IN THE UNITED STATES

E-27

GAS CLASSIFIED

Classified advertising is set in 6-point type, without border or display, at the rate of 15 cents per word per insertion; minimum charge per insertion $3. Box numbers for replies count as 5 words. Count as a word each one letter word and each group of figures. Classified advertising is only accepted when payment accompanies order. Copy and payment must reach publisher's office prior to 10th of month preceding publication.

You get low-cost results in GAS classified ads, because GAS has wider circulation than any other gas publication — 33% more total circulation and 55% more circulation in gas companies.

MANAGER

POSITION AVAILABLE: Manager, combination utility and LP-Gas operation in Northeast. Profitable company. Excellent prospects advancement. Box 55, GAS, 198 S. Alvarado St., Los Angeles 57, Calif.

HELP WANTED
SALES ENGINEER

Ohio sales office base, travel eastern territory contacting engineering and purchasing departments of appliance manufacturers. Knowledge of A.G.A. requirements necessary. Answer fully, stating work history, education,, age, experience, salary expected, etc. Enclose recent snapshot. Permanent connection with progressive Gas Controls Manufacturer. Thermac Company, 800 East 108th Street, Los Angeles 59, California.

stand by or year 'round

LP-GAS PLANTS

designed • installed

H. Emerson Thomas & Associates, Inc.
P O BOX 270 WESTFIELD N J

M-SCOPE PIPE FINDER

MODEL AB
ONE MAN OPERATION
HEAVY DUTY PERFORMANCE
ONLY $149.50

FISHER RESEARCH LAB., Inc.
PALO ALTO, CALIFORNIA

IT'S UNITED FOR

Dependable L-P Gas supply
Assured deliveries
Engineering consulting service

UNITED PETROLEUM GAS CO.
806 Andrus Bldg. Minneapolis 2, Minn.

JAMES R. COWLES
Cathodic Protection Engineer
INSTRUCTION
6517 East 6th Street, Tulsa, Oklahoma
Phone 8-1867

LP Gas Installations
and
Anhydrous Ammonia Plants
More than 80 Peacock Plants prove . . .
"There's No Substitute For Experience"
PEACOCK CORPORATION
Box 268, Westfield, N. J. Westfield 2-6258

A new Super-Sensitive 97 db gain fluid leak detector circuit has been incorporated into the new Electronic Witch that further increases the field usability.

Fisher Research Laboratory Inc.

■

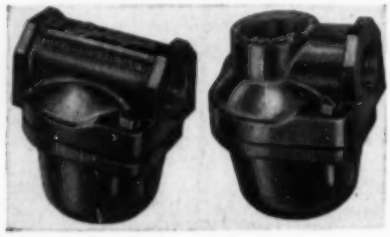
5 Packaged Control System

Ten separate packaged control systems, individually designed for specific furnace, oven, kiln or dryer applications, are now available from the Bristol Co. The packages enable a designer with a particular heating problem to select a complete control system engineered to satisfy his particular requirements.

These Bristol-Beck control packages have been designed to operate on-off or proportional-fuel valves or electric contacts. They include all components necessary for a complete installation, including a Bristol Dynamaster pyrometer, a Beck relay or Putmo controller, and a Beck motor operator.

Bristol Co.

■



6 Dust Trap

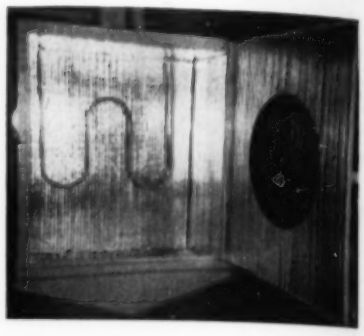
Sprague Meter Co.'s new all-metal dust trap features a filtering element consisting of a porous bronze casting. Each element is tested for controlled porosity, which will not change up to 15 psi differential pressure.

The filter operates on these principles: (1) velocity; (2) centrifugal force, which will remove up to 70% of the dust; (3) the filtering element, which removes dust particles down to 10 microns in size. Present units can be supplied in ¾-in. and 1-in. female pipe sizes and straight or angle connections (see photos). The bowl and element can be removed for inspection or replacement without disturbing the piping.

The element can be cleaned and re-used in the field or shop. Operating pressures: up to 150 psi. The 1-in. units are available with insulating bushings for cathodic protection. Capacity —125 cf/hr, .6 sp gr gas at .5-in. wc; 181 cf/hr at 1-in. wc.

Sprague Meter Co.

■

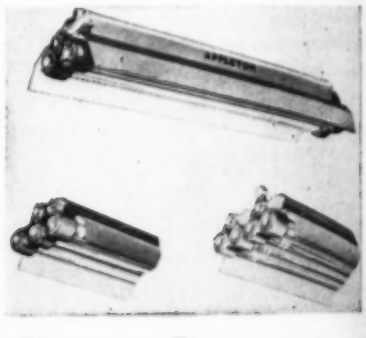


7 Meter Gauge and House

A new insulated orifice meter gauge and house, Model 10B, is now being produced by Gordon Z. Greene Co. The house, which measures 32 in. x 24 in. x 16 in., is made of 18-gauge sheet steel. The inside is coated with rust resisting paint, and the outside has a prime coated finish of high grade aluminum paint. It is insulated with corrugated foil covering asbestos and contains heating coil. In addition, the house has a 14-gauge floor with a leveling saddle for mounting instruments. The underside has a flange for attaching to standard. Meter housing is completely weather-proofed, with rubber stripping around the door.

Gordon Z. Greene Co.

■



8 Fluorescent Fixtures

A new line of EFU explosion-proof fluorescent fixtures for use in hazardous locations (Class I, Groups C and D; Class II, Groups E, F, and G) has been introduced by the Appleton Electric Co.

Two, three, and four-lamp designs for both straight and angle mounting are included. Three different ballasts are available: bi-pin "Pre-Heat"; single-pin "Slimline"; and bi-pin "Rapid Start" that provides

longer lamp and ballast life, quiet operation, and flicker-free illumination with no starters required.

These Appleton EFU fixtures permit safe re-lamping from either end. Fixtures may be installed in a continuous row, end to end. They are designed for use with 40-watt, 48-in., T-12 and 100-watt, 60-in. T-17 fluorescent lamps and are factory sealed, eliminating the need for external seals normally required within 18 in. of arcing devices. Line connections are made to a terminal block in the junction chamber.

The Appleton Electric Co.

■

9 Pipe Thread Compound

Crane Packing Co. is now making its plastic lead seal pipe thread and gasket sealing compound available in 1-lb brush-top cans, thus providing a permanent type applicator. The need for cleaning the applicator after each use is eliminated.

Other advantages of the new applicator are the brush, which permits working the compound more thoroughly into the threads; the flat shank, from which excess compound can be easily removed without waste; and the fact that it extends to the bottom of the can to enable full use of the contents. Plastic lead withstands pressures up to 6000 psi, temperatures to 500° F, and is insoluble in water, steam, gas, refrigerants and all petroleum products.

Crane Packing Co.

■

10 Clothes Dryer

A low cost Time-Line clothes dryer designed to put automatic drying within the reach of more families has been announced by the Norge Div. of Borg-Warner Corp. All important features of the deluxe Time-Line dryer are included in the new dryer, except the four-way drying, a deluxe model exclusive. It has automatic thermostatic controls which limit dryer

Gas FIRED
Peerless HEATING EQUIPMENT
THE COMPLETE LINE FOR ALL Gas NEEDS
Forced Air and Gravity Circulators, Radiant Heaters, Panel Heaters and Fan Type Unit Heaters. 68 Years of progressive advancement has developed this complete, tried and proved line—styles, types and sizes for domestic, commercial or defense heating requirements.
A.G.A. Approved
Stylewise, Qualitywise and Pricewise The PEERLESS Line Is Best for Every Heating Requirement—For Small Homes, Apartments, Housing Projects, Defense Housing, Churches, Schools, Motor Courts, Stores, Offices, Shops.
Write for literature and prices today.
PEERLESS MANUFACTURING CORP., —— LOUISVILLE 10, KENTUCKY

I'm the happy little character now selling friendly service for 51 gas companies. I add interest, friendliness, and effectiveness to all their advertising and sales promotion. I'll do the same for you. Complete utility service one-half cent per customer per year. $25 minimum. Satisfaction guaranteed. Write for details and free idea file. Handy Flame Service, P. O. Box 302, Indianapolis 6, Ind.

PEAK SHAVER

BY DRAKETOWN ®

This packaged propane plant designed, engineered and built by Draketown, provides a completely interchangeable fuel for natural gas.

Draketown can design and build one for you, *within your budget,* to take over all or part of your load at the turn of a valve.

STANDBY
AUGMENTATION
100% TOWN OR PLANT SUPPLY

Serving utility and industry for over thirty years

DRAKE & TOWNSEND
INCORPORATED
Consulting • Design • Engineering • Construction
11 WEST 42ND STREET • NEW YORK 36, N. Y.

temperatures to a safe 140°, eliminating burning and scorching dangers. All phases of drying over a two-hour period with 10 minute groupings, including damp-dry and dry indications, are registered on the control panel. Nine pounds of dry clothes or 18 lb of damp clothes can be tumble-dried in the 29-in. cylinder. Other features include a 180° opening door with knee latch release, five-way venting and automatic shutoff when drying is completed. The dryer is finished with baked enamel, with a porcelain top that can serve as a counter for sorting or folding clothes.

Norge Div., Borg-Warner Corp.

■

11 30-in. Range

RCA Estate Appliance Corp.'s new 30-in. ranges feature a 24-in. oven and a "finger-lift" drawer broiler that adjusts to five different positions at the touch of a lever. The range has a one-piece top from mantel back to oven door.

Double-thick Fiberglas wall insulation plus a Fiberglas heat-seal between oven door and front frame combine with a new structural design that minimizes metal-to-metal contact from inside to outside walls.

RCA Estate's throw-away aluminum burner bowl inserts, Dispos-a-Bowls, will be included in the 1954 line.

RCA Estate Appliance Corp.

Trade Literature

12 Service and Product Brochure

General American Transportation Corp. has issued a new brochure covering the company's services and products. The 47-page book has been divided into three sections: (1) leasing services; (2) car building and other manufacturing; and (3) export division, offices and plants, and research and development. Each section is fully illustrated and contains informative text.

General American Transportation Corp.

■

13 Odorant Reports

Sharples Chemicals Inc. has released Report 53-6, "Handling Sharples Gas Odorants," and Report 54-3, "Physical Properties —Sharples Gas Odorants." Report 53-6 lists the characteristics and properties of Spotleak 1008, Spotleak 1009, Pentalarm 86, and Pentalarm 1004 in tabular form. Seven graphs show vapor pressure—temperature, viscosity—temperature and specific gravity—temperature relationships, etc.

Report 53-6 contains detailed information on odor intensity, explosive properties, toxicity, and storage, handling and equipment recommendations.

Sharples Chemicals Co.

■

14 Thermometer Catalogs

Three new catalogs are available from Minneapolis-Honeywell. (When ordering copies use letter preceding description together with number of this notice.)

(a) A new 44-page catalog on remote bulb thermometers covers selection data, recorders and indicators, pneumatic control, electric control, program control, psychrometers, bulbs, tubing and fittings.

(b) Bulletin 6401 describes and illustrates the applications of a moderate cost pneumatic thermometer controller.

(c) Catalog 5701 describes resistance thermometer bulbs of high speed, marine, room temperature and sanitary types, for temperature spans as narrow as 20 F. Also included are wet and dry bulb resistance thermometer assemblies for measurement of relative humidity.

Minneapolis-Honeywell Regulator Co.

■

15 Safety Booklet

"How to Make Gas Connections Safely" is the title of a booklet issued recently by the Mueller Co. It is composed of reprints of two-page, two-color advertisements that the company ran during its 1953 campaign. It shows pictorially the step-by-step procedure for installing gas fittings and line stopper equipment in a gas distribution system.

Mueller Co.

■

16 Ground Test Bulletin

Electrical ground resistance testing with Vibroground is the subject of an eight-page bulletin issued by Associated Research Inc. Modern tools for all ground resistance tests are described. Subject matter includes man-made grounds, soil resistivity and soil resistance for corrosion engineering, anode resistance, circuit resistance, polarization effects, soil resistivity, and earth resistivity.

Associated Research Inc.

■

17 Concrete Cutter Bulletin

A four-page bulletin has been released that describes Tri-Line Co.'s concrete cutter. The cutter's use by cities, counties, states, public utilities, industrial plants, airports, and private contractors is fully illustrated. In addition to describing the tool's uses, complete specifications are presented in the bulletin.

Tri-Line Co.

■

18 Insulation Catalog

Tips on the installation of Gilsulate, triple-zone insulation for hot underground pipes, is given in a four-page illustrated, two-color publication issued by American Gilsonite Co. The publication shows how Gilsulate is poured around pipes exposed in trenches to produce permanent thermal insulation and corrosion protection.

American Gilsonite Co.

■

19 Furnace Pamphlet

An information piece on Royal Jet's "Tall Red" forced-air furnace is now available. The pamphlet published by Royal Jet Inc. describes the features of the heating unit and includes installation and technical data.

Royal Jet Inc.

Mail this Coupon for **NEW PRODUCTS INFORMATION** **COPIES OF NEW LITERATURE**

GAS, 198 S. Alvarado St., Los Angeles 57, Calif.

5/54 Fill in number of items in which you are interested.

No. ..... No. ..... No. ..... No. .....

No. ..... No. ..... No. ..... No. .....

NAME AND TITLE .....

FIRM'S NAME .....

ADDRESS .....

CITY ..... ZONE ..... STATE .....

GAS

Transmission and Conditioning Section

Thousands of miles... millions of dollars...

This shipment of pipe is worth only a small portion of the hundreds of millions of dollars that will be spent this year to expand transmission facilities throughout the nation. GAS magazine's annual transmission maps and company breakdowns appear in the following section. In the above photograph, the year's first big shipment of 77 carloads of pipe for the Ohio Fuel Gas Co. was nearing its destination. The 20-in. pipe is part of the company's half-million dollar pipeline project that will complete the final link of a line to move gas across the central part of the state.

ARMCO

Spiral Welded Casing

Seven carloads of Armco Casing delivered to a major oil company in Texas.

NOW IN STOCK AT THE FOLLOWING NATIONAL TANK COMPANY BRANCHES:

Abilene, Texas
Casper, Wyo.
Clay City, Ill.
Electra, Texas
Great Bend, Kan.
Hobbs, New Mexico
Houston, Texas
Lake Charles, La.
New Iberia, La.
Odessa, Texas
Oklahoma City, Okla.
Pampa, Texas
Corpus Christi, Texas
Seminole, Okla.
Shreveport, La.
Sidney, Neb.
Williston, N. D.
Edmonton, Alberta

- EXACT 40' LENGTHS
- HIGH COLLAPSE RESISTANCE
- UNIFORM WALL THICKNESS
- FAST RUNNING TIME
- SAVES TONNAGE
- SAVES MONEY

STOCKS CARRIED AT MILL READY FOR IMMEDIATE CARLOAD SHIPMENTS.

Distributed exclusively in U.S. and Canada by National Tank Company

Manufactured by Armco Drainage & Metal Products, Inc.

NATIONAL TANK COMPANY

TULSA, OKLAHOMA

1954 construction approaches GAS survey levels of record years

FOR capital expenditures in their transmission departments in 1954, 86 gas companies—utilities and pipeline companies together—have budgeted on a firm basis more than $760 million.

This figure, compiled from the 1954 GAS Construction Survey,* gives only an inkling of the vast nationwide construction program under way or planned throughout the entire gas utility and pipeline industry. Coupled with other data based on certificates approved by and pending before the Federal Power Commission, the Canadian government, and a few state commissions, these figures give a clear indication that the current year's activity is on a level comparable with the best years of the past.

These other data are not included in the survey tabulations for several reasons, e.g., some of the projects may not be completed this year; some are not certified as yet; some involve construction in Canada; others were begun under 1953 budgets and are now being completed, and the 1954 budget covers only a portion of the total. When compared with previous compilations of construction figures, using the same bases, these data make it appear that 1954 could conceivably match the best years in history!

Consider these comparisons:

Dollar volume of projects approved or underway: in 1954, $431 million; in 1953, $328 million.

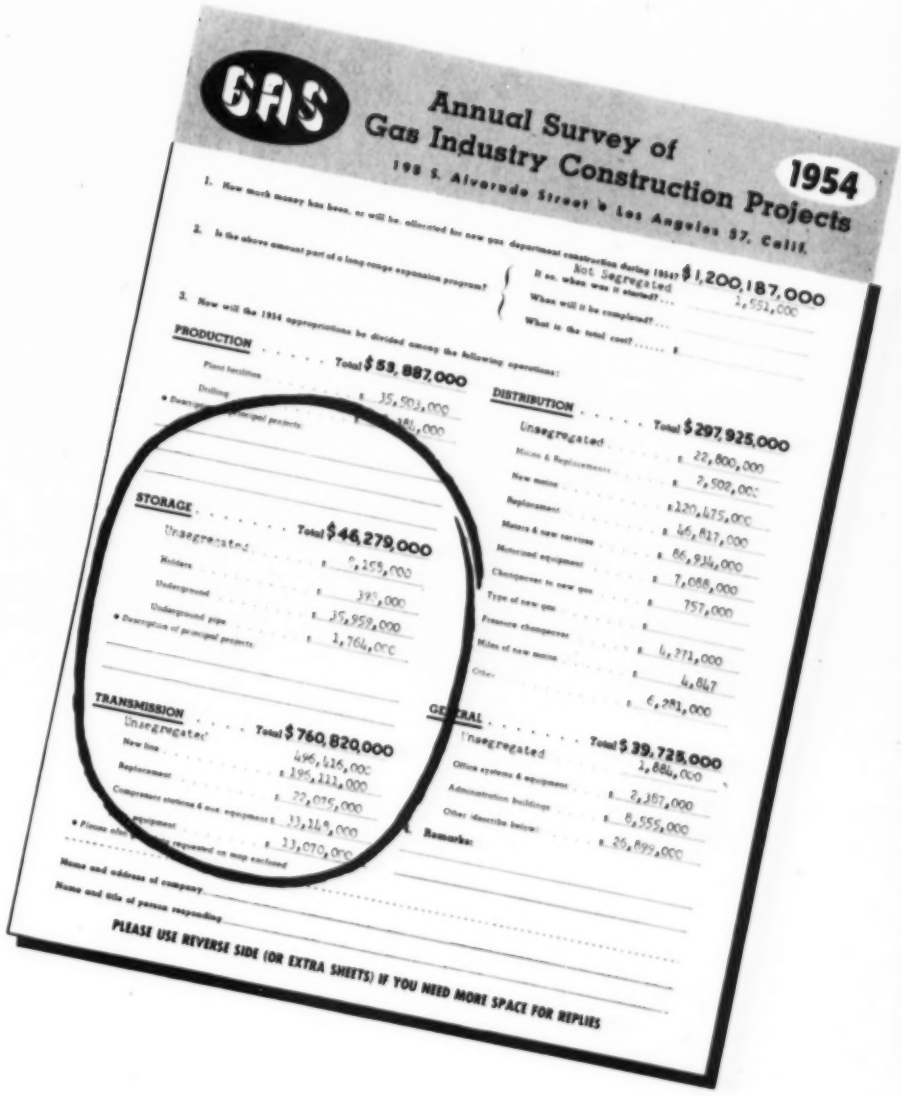
Total mileage of lines approved or underway: in 1954, 5185; in 1953, 5312.

Total dollar volume of projects proposed or planned: in 1954, $1232 million; in 1953, $2173 million.

Total mileage of lines proposed or planned: in 1954, 14,166; in 1953, 13,595.

On the following pages are the 1954 editions of the annual pipeline progress maps: the first covers lines approved or under construction in the current year, with key descriptions starting in the right-hand columns on this page; the second covers lines proposed or planned, starting on page 110.

*For a complete tabulation and recap of the 1954 survey, refer to pages 33-38.


GAS

Annual Survey of Gas Industry Construction Projects

1954

198 S. Alvarado Street • Los Angeles 57, Calif.

1. How much money has been, or will be, allocated for new gas department construction during 1954? Not Segregated $1,200,187,000
If so, when was it started? 1,551,000
When will it be completed?
What is the total cost? $

2. Is the above amount part of a long range expansion program?

3. How will the 1954 appropriations be divided among the following operations?

PRODUCTION . . . . . Total $59,887,000
Plant facilities $ 35,503,000
Drilling 180,000
• Description of principal projects

STORAGE . . . . . Total $46,279,000
Unsegregated $ 9,109,000
Holders 39[illegible],000
Underground $ 35,959,000
Underground pipe $ 2,764,000
• Description of principal projects

TRANSMISSION . . . . . Total $760,820,000
Unsegregated 496,426,000
New line $ 196,223,000
Replacement $ 22,075,000
Compressor stations & misc. equipment $ 33,246,000
• Private ditching equipment $ 23,070,000
Items requested on map enclosed

DISTRIBUTION . . . . . Total $297,925,000
Unsegregated $ 22,800,000
Mains & Replacements $ 2,502,000
New mains $ 220,475,000
Replacement $ 46,817,000
Mains & new services $ 86,934,000
Meters and equipment $ 7,088,000
Changeover to new gas $ 757,000
Type of new gas
Pressure changeover $
Miles of new mains $ 4,771,000
Other $ 4,847
$ 6,281,000

GENERAL . . . . . Total $39,725,000
Unsegregated 2,886,000
Office systems & equipment $ 2,367,000
Administration buildings $ 6,555,000
Other (describe below) $ 26,899,000
Remarks:

Name and address of company
Name and title of person responding

PLEASE USE REVERSE SIDE (OR EXTRA SHEETS) IF YOU NEED MORE SPACE FOR REPLIES

1. Atlantic Seaboard Corp., Charleston, W. Va. A 112-mile, 26-in. loop to existing pipeline from Clendenin, W. Va., to Baltimore, Md. and 4400 additional hp. Construction to start this spring on the $1,535,000 facilities to serve Baltimore, Washington, D. C., and Richmond, Va.

2. Central Kentucky Natural Gas Co., Charleston, W. V. An 8.8-mile, 20-in. lateral extending from connection with Gulf Interstate in Menifee county, Ky. to its own Means, Ky. compressor station.

3. Cities Service Gas Co., Oklahoma City. An addition of 1100 hp to Edmond (Oklahoma county) compressor station and 69 miles of 20- and 16-in. line in Oklahoma, McClain, and Garvin counties to maintain daily inputs into the company's system south of the Blackwell station. Facilities recently completed. Cost: $3,002,700.

4. Colorado Interstate Gas Co., Colorado Springs. A 50-mile, 20-in. line from the Greenwood field in Morton county, Kan., to connect with the Natural Gas Pipeline Co. of America line at Hooker, Okla. Cost: $2.6 million. Just completed: 49 miles of 20-in. loop line from Kit Carson station toward Denver; 30 miles of 12-in. to connect 20-in. with Morton county, Kan. compressor station; and 26,900 hp compressor capacity at new and existing stations in Colorado, Oklahoma, Texas, and Kansas.

5. Cumberland & Allegheny Gas Co., Pittsburgh. A 5.3-mile line starting at Warren district, W. Va., extending to the city of Buckhannon. Cost: $115,600.

6. East Tennessee Natural Gas Co., Knoxville. A 100-mile, 16-in. extension to its system from near Knoxville to the Kingsport, Tenn. area, with about 58 miles of various sized laterals. To serve Morristown, Johnson City, Elizabethton, Bristol, Greenville, and Kingsport. Cost: $5.8 million. Fa-

1954 pipeline construction • approved and underway

Key to construction projects shown on the map

cilities completed early this year.

7. El Paso (Texas) Natural Gas Co. A 1056-mile line consisting of about 750 miles of 30-in. and 70 miles of 24-in. mainline with related gathering lines and purification facilities to carry gas from Permian and San Juan basins for additional deliveries to its California, New Mexico, and Arizona customers. A total of 161,860 hp in compressor stations, including seven new stations: Pembrook, Midkiff, and Driver, in the Permian basin; Plains in Yoakum county; and Pampa in Carson county, all in Texas; the Bluewater and Lincoln stations in New Mexico. Additions to five stations in Goldsmith in Ector county, Texas; Eunice in Lea county, N. M.; Navajo, Leupp, and Williams in Arizona. Cost: $175,250,000.

8. Gulf Interstate Gas Co., Houston. An 860-mile, 30-in. line from Point Rayne, La. through Mississippi and Tennessee to Boyd county, Ky., with 229 miles of lateral lines and five 8000-hp compressor stations. To transport 375 MMcf of gas per day for United Fuel Gas Co., Charleston, W. Va., and Central Kentucky Natural Gas Co., a United affiliate. Cost: $127,887,000. At present more than 700 miles completed. Remainder expected to be completed by Nov. 1.

9. Home Gas Co., Pittsburgh. A 49.7-mile line from Halsey Valley, N. Y., to Deposit, N. Y. Cost: $2,138,500.

10. Kansas-Nebraska Natural Gas Co., Phillipsburg, Kan. A 26-mile, 12-in. line recently completed from Ogalla, Neb. to Big Springs, Neb. gas field.

11. Lone Star Gas Co., Dallas. Approximately 90 miles of line ranging in size from 10-in. to 20-in. throughout system. Total transmission outlay for new line and replacements: $2,871,700.

12. Manufacturers Light & Heat Co., Pittsburgh. A 75-mile 20- and 16-in. line in the "tri-state" area around Pittsburgh and the northeast panhandle of West Virginia and in and around eastern Pennsylvania, near the Maryland state line to reinforce Manufacturers' system in that area. Also, a 4400-hp compressor station. Cost: $5,968,300.

13. Missouri Public Service Co., Warrensburg, Mo. A 25-mile, 10-in. line from Warrensburg to supply the city of Clinton, Mo. with natural gas. Cost: $676,010.

14. Natural Gas Pipeline Co. of America, Chicago. An additional 1250 hp at existing compressor station in Hooker, Okla., and 2750 ft of 24-in. line connecting station.

15. Nevada Natural Gas Pipe Line Co., Las Vegas. A 120-mile, 12¾-in. line from Topock, Ariz. to Las Vegas and Henderson areas. Construction just completed. Cost: $1.5 million.

16. Niagara-Mohawk Power Co., Syracuse, N. Y. A 6-mile line from Higby road regulator station near Utica, N. Y., to New Hartford. Cost. $370,000.

17. Northern Natural Gas Co., Omaha. Mainline loop additions for 1954 will total approximately 200 miles of 24- and 30-in. line at a cost of $17,833,000. Twenty-four thousand hp will be added to six compressor stations. Cost: $5,699,000. In addition, almost 140 miles of branch loop lines ranging in size from 3 to 24 in. will be constructed to serve presently connected communities in Iowa, Minnesota, Nebraska, and South Dakota at a cost of $4,973,000. A total of 716 miles of branch lines ranging in size from 2 in. to 20 in. will be constructed in 71 new communities in Iowa, Nebraska, South Dakota, and Minnesota. Cost: $14,359,000.

18. Ohio Fuel Gas Co., Columbus. A 63-mile, 16- and 20-in. loop line to insure service to Dayton, Cincinnati, Springfield, Lima, Kenton, Toledo, Findlay, Fostoria, Bowling Green, Milan, Norwalk, Monroeville, Belleville, Clyde, and Fremont areas. Cost: $2,668,000.

19. Pacific Gas & Electric Co., San Francisco. About 200 miles of loops being laid parallel to Super Inch line: Includes 2500 additional hp at Topock compressor station. Also 87.8 miles between Newberry and Danby in San Bernardino county; 32 miles starting north of Hollister in San Benito county and running south of that city; and 88 miles from a point south of Kettlemen Hills in Fresno county to near Arvin, in Kern county.

20. Permian Basin Pipeline Co., Omaha. A 234-mile line—200 miles extending from the Mitchell Co. removal plant in Pecos county, Texas to the Plymouth and Pembrook compressor stations in Uptown county and the Spraberry station in Midland county, and to a connection with El Paso Natural at its proposed Plains station in Yoakum county, Texas; and 34 miles from a station at Hobbs, N. M., to the Plains station connection. The project includes installation of 54,880 hp at the four stations. Permian will deliver 300 MMcf of gas to El Paso Natural at the Plains connection and take delivery of a like amount at El Paso's Dumas station for sale to Northern Natural Gas Co. at that point. Cost: $43,530,000. Entire program just completed.

21. Public Service Co. of North Carolina, Gastonia, N. C. An 85-mile line from Kings Mountain to Asheville, costing $2.5 million. The line was to be completed March 1 to serve cities in western part of North Carolina.

22. Shenandoah Gas Co., Lynchburg, Va. A 39-mile line from Middletown, Va., to points near Winchester, Va. and Martinsburg, W. Va. to connect with Atlantic Seaboard Corp.'s line near Middletown. Cost: $1,466,500.

23. Southern California and Southern Counties Gas Co.'s, Los Angeles. Additional hp at existing Blythe, Mountain View, and Kettleman Hills compressor stations totaling 5850 and 5.5 miles of 30-in. line in south and southwest Los Angeles. Cost: $2,152,000.

24. Southern Natural Gas Co., Birmingham. About 7 miles of 16-in. line starting at Pickens compressor station in Mississippi and extending south. Cost: $306,800, and $69,000 for a river crossing. Another line 48.5 miles of 18-in. starting north of the Rankin compressor station, also in Mississippi. Cost: $2,288,000, and $104,400 for a river crossing. Twenty-nine miles of 18-in. line at the Gallion compressor station in Alabama. Cost: $1,397,000. And another 26.2-mile line beginning east of the Elmore station in Alabama. Cost: $1,267,200, plus $119,900 for a river crossing. Will add to the system's present capacity.

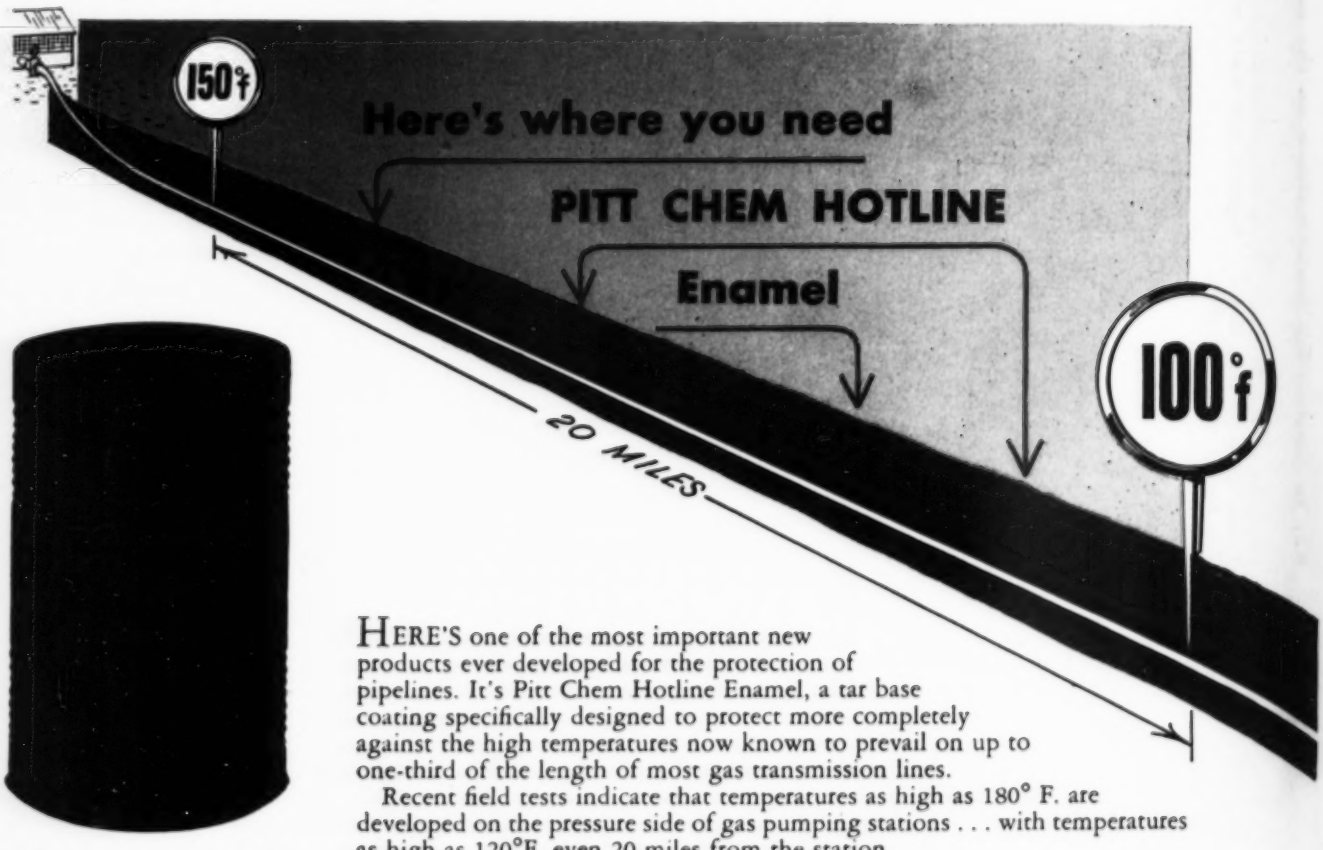
25. Tennessee Gas Transmission Co., Houston. A 574-mile, 30-in. line to begin at the Kinder, La. compressor station and extend northeast through Louisiana, Mississippi, and Tennessee to join the existing system at the Portland, Tenn. compressor station. Includes 63 miles of 26-in. line to be laid parallel to existing sections in Ohio and Pennsylvania between Ohio river and the Mercer, Pa. station. Also, 67-mile, 30-in. loop in Texas and Louisiana; 45-mile, 20-in. line from Buffalo to U. S.-Canadian border; 58-mile, 20-in. line from Gulf coast to Kinder station; 100 miles of laterals in Texas; 3200 hp addition at East Bernard, Texas station; 4800 hp addition at Cleveland, Texas; 1600 hp at Jasper, Texas; 4800 hp at Natchitoches, La.; and 1320 hp at Middleton, Tenn. A new 7600-hp compressor station near Coudersport, Pa., and a 7600-hp station near Findley Lake, N. Y. Cost: $91,718,000.

26. Texas Illinois Natural Gas Pipeline Co., Chicago. A $3.8 million suspension bridge near Grand Tower, Ill., over the Mississippi. Addition of six new compressor stations, five having a capacity of 12,000 hp and one of 10,000 hp at Wharton and Lufkin, Texas; Texarkana and Searcy, Ark.; Perryville, Mo.; and Decatur, Ill. Completed in February to complete company's $35 million expansion program to serve Chicago region utilities. Also 10,000 hp additions to existing stations at Conroe and Marshall, Texas; Malvern and Biggers, Ark.; and Centralia, Ill.

27. United Fuel Gas Co., Charleston, W. Va. A 57.6-mile, 30-in. line from Big Sandy river to Lanham compressor station in Putnam county, W. Va., and 3300 hp addition to existing station. Cost: $1,225,000. An 18.4-mile, 20-in. line from Lanham station to storage pool with two new compressor stations totalling 7700 hp. Cost: $1.5 million. Construction to begin this spring on the line and this summer on the compressor stations. Purpose: to help expand company's undeground storage facilities.

New PITT CHEM Fills Big Gap in

First Enamel Formulated to Withstand High Line Temperatures on Pressure Side of Pumping Stations



HERE'S one of the most important new products ever developed for the protection of pipelines. It's Pitt Chem Hotline Enamel, a tar base coating specifically designed to protect more completely against the high temperatures now known to prevail on up to one-third of the length of most gas transmission lines.

Recent field tests indicate that temperatures as high as 180° F. are developed on the pressure side of gas pumping stations . . . with temperatures as high as 120°F. even 20 miles from the station.

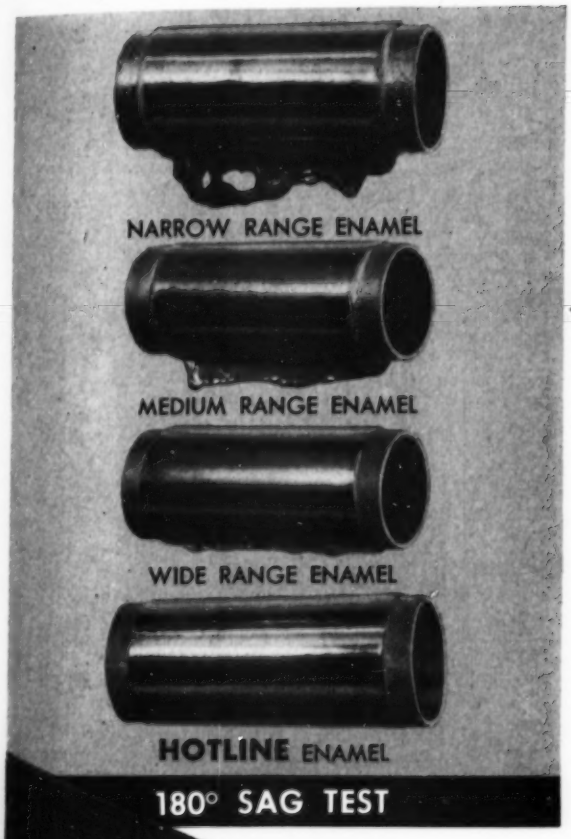
These temperatures can have several important effects on pipeline enamels. They can cause them to sag or flow off and expose the pipe, or to become so soft that soil stress and pressure can cause penetration of the enamel, resulting in apparent low coating resistance.

Even with these high temperature characteristics, the minimum softening point of Pitt Chem Hotline Enamel is only 240° F. The new enamel has less tendency to cold flow than any other coal tar coating. This quality, combined with its exceptional hardness and non-flow characteristics, indicates that a much higher resistance to soil and pressure stresses can be expected with Pitt Chem Hotline Enamel.

Pitt Chem Hotline Enamel is ideal for the following applications: On gas pipelines where service temperatures are above 100° F. In areas where excessive soil stress conditions prevail, or where the backfill and trench are rough, full of stones and rough objects which normally penetrate softer coatings. On all types of pipelines where ground temperatures are high most of the time.

For more information on this revolutionary advance in pipeline protection, call or write today for free Pitt Chem Hotline Enamel brochure.

HOTLINE Enamel Pipeline Protection

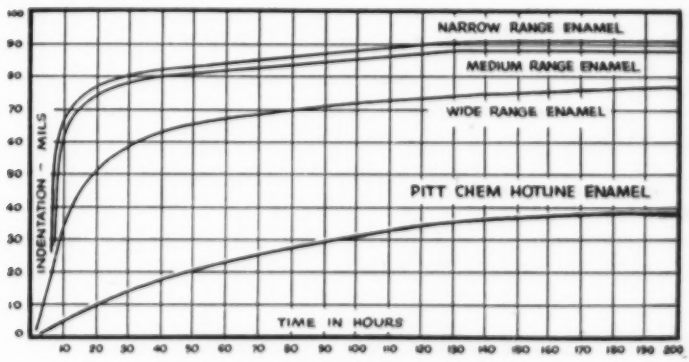


Proof of HOTLINE'S Resistance to sagging at high temperatures

These are actual pictures of sections of pipe coated with four different grades of pipeline enamel. These sections were exposed to 180° F. sag test temperatures. Note that only Pitt Chem Hotline Enamel resisted sagging.

Proof of HOTLINE'S Superior Resistance to soil stress damage

The chart below shows the degree of penetration that occurs when the three popular grades of enamel and Hotline are subjected to a pressure of five pounds psi. and tested over a period of 200 hours at 120° F. Pitt Chem Hotline Enamel's resistance to penetration is almost twice as great as any of the other three grades.



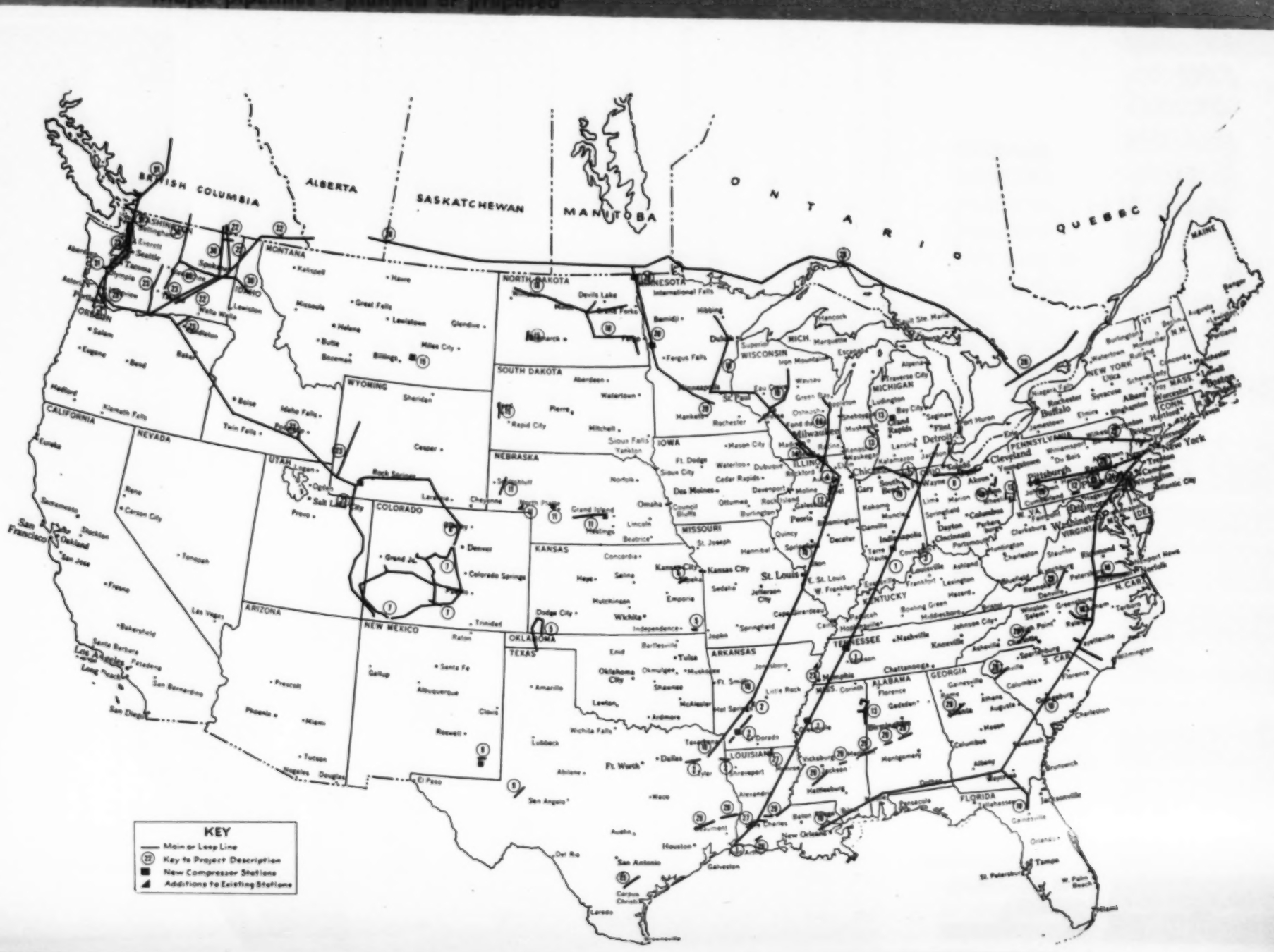
Cold Flow of Bituminous Coatings
Indentation by ½" D. Rod, 120° F., 5 psi Load

PITTSBURGH COKE & CHEMICAL CO.

W&D 5140

COAL CHEMICALS • AGRICULTURAL CHEMICALS • FINE CHEMICALS • PROTECTIVE COATINGS • PLASTICIZERS • ACTIVATED CARBON • COKE • CEMENT • PIG IRON

Major pipelines - planned or proposed



Key to construction projects shown on the map

1. American Louisiana Pipe Line Co., Detroit. A 1200-mile, 30-in. line from North Tepetate, Acadia parish, La. to a point of connection with Michigan Consolidated Gas Co.'s facilities near Detroit. A 22-in. portion of the line would extend from the 30-in. near Payne, Ohio to a connection with Michigan-Wisconsin Pipe Line Co.'s system near Bridgman, Mich. A 24-in. and smaller size line will feed gas into the 30-in. at North Tepetate. The project also calls for installation of three compressor stations of 10,000 hp each. All American Louisiana gas will be purchased by Michigan Consolidated and Michigan, Wisconsin, both affiliates. Cost, $130 million.

2. Arkansas-Louisiana Gas Co., Shreveport. A 109-mile line ranging from 8⅝ in. to 24 in. in 9 different sections of the company's system in Arkansas, Louisiana, and Texas, and a new 10,500-hp compressor station to increase the system's capacity to meet gas requirements of customers. Cost: $9,245,-166.

3. Central Kentucky Natural Gas Co., Charleston, W. Va. A 15.4-mile, 20-in. line from Cold Springs (Ky.) measuring station to serve Cincinnati, Ohio. Cost: $1,551,600.

4. Chicago District Pipeline Co., Chicago. A 16-mile, 30-in. line from Joliet to Chicago. Cost: $2,420,000.

5. Cities Service Gas Co., Oklahoma City. A 24-mile, 26-in. line from Ottawa, Kan. to Gardner, Kan.; a 9-mile, 20-in. line from Cherokee county, Kan. to Joplin, Mo.; and 110 miles of gathering lines in the Hugoton field. Cost: $2,542,000.

6. Colorado Interstate Gas Co., Colorado Springs. A 365-mile, 22-in. line from Denver to connection with proposed Pacific Northwest Pipeline Corp. line at Rock Springs, Wyo. with 4400-hp compressor station at Rock Springs, Wyo. Cost: $23 million.

7. Colorado Western Pipeline Co., Denver. A 708-mile line consisting of 454 miles of trunk line and 254 miles of lateral from Cortez, Colo. to Denver, the mainline to serve Durango, Cortez, Montrose, Gunnison, and Salida in addition to Denver. The 254 miles of laterals would serve Delta, Saguache, Monte Vista, Del Norte, Alamosa, Canon City, Florence, Portland, Pueblo, Buena Vista, Leadville, and Climax. Cost: $33 million. Another line, 328 miles of 16-in. and 18-in. pipe from La Plata county to Pagosa Springs, Del Norte, Redwing, Gardner, Pueblo, Colorado Springs, and Denver. Cost: $21.6 million.

8. East Ohio Gas Co., Cleveland. A 112-mile, 26-in. line extending from a connection with Panhandle Eastern Pipe Line Co.'s line at Maumee, Lucas county, Ohio to East Ohio's Brush farm station in the northern part of Summit county, Ohio, to serve the Cleveland area. Cost: $8,438,000.

9. El Paso Natural Gas Co., El Paso. A 13.3-mile line in Lea county, N. M., to enable it to acquire up to 56 MMcf additional gas per day in the Permian basin area and to permit greater flexibility in operation of its pipeline facilities in the area. Also, a 1540-hp compressor station. Cost: $3,295,-589. Also, a 32½-mile, 10¾-in. line extending from the Barnhart Hydrocarbon Corp.'s gasoline plant in Reagan county to a connection with El Paso's existing system in Upton county, Texas, to enable it to acquire 20 MMcf of gas daily in Reagan county. Cost: $798,600.

10. Houston Texas Gas & Oil Co., Houston. A 30-in. line approximately 1200 miles long extending from Texas north to the Chicago area, through Wisconsin and into Minnesota and another line more than 1000 miles in length extending from Louisiana through Alabama, Georgia, South Carolina, North Carolina, Virginia, Maryland, Pennsylvania, New York, and New Jersey. Cost: $300 million.

11. Kansas-Nebraska Natural Gas Co., Hastings, Neb. A 95-mile, 10- and 8-in. line from Cozad, Neb. to Grand Island to increase the load capacity of the northeast part of the company's system; a 36-mile, 10- and 6-in. line from south of Bridgeport, Neb. to Alliance, to serve Alliance. Also, 1200 hp addition to the Big Springs compressor station, 500 addition at Grand Island, and a new 1500-hp station at North Platte. Cost: $2,858,995.

12. Manufacturers Light & Heat Co., Pittsburgh. Approximately 75½ miles of 10-, 12-, 20-, 24-, and 26-in. replacement and loop lines, a new 3300-hp compressor station, and 880 hp additional at an existing station. Facilities to be in Washington, Allegheny, Chester, Lancaster, and Adams counties, Pa., and Marshall county, W. Va. New facilities will enable Manufacturers to handle additional volumes of gas expected next winter. Cost: $5,792,550.

13. Michigan Consolidated Gas Co., Detroit. A 25½-mile, 12-in. line from connection with Michigan Wisconsin Pipe Line Co. line near Sparta to Muskegon, Mich., and a 32,000-hp compressor station for storage in Six Lakes field in Mecosta and Montcalm counties, Mich. Cost: $11.4 million.

14. Michigan Wisconsin Pipe Line Co., Detroit. A 252-mile loop consisting of 24-, 18-, 12-, 6-, and 4-in. pipe will be added to its existing facilities, mostly in Wisconsin. It will also add 3400 hp addition to existing compressor stations. Cost: $11.4 million.

15. Montana-Dakota Utilities Co., Minneapolis. A 34-mile loop paralleling existing transmission system from Rapid City, S. D. to the Deadwood-Lead lateral junction; a 2640-hp compressor station at Hardin, Mont.; and a 21.7-mile line starting at the Bismarck-Dickinson, N. D. line to serve Mott, Regent, Lefor, and New England, N. D. Cost: $1,630,600.

16. Natural Gas Co. of West Virginia, Pittsburgh. Approximately 22 miles of replacements. Cost: $500,000.

17. Natural Gas Storage Co. of Illinois, Chicago. A 36-in. line approximately 30 miles long from Herscher storage area to Joliet and a 24-in. offshoot of it to a connection with the line of Natural Gas Pipeline Co. of America to Chicago area.

18. North Dakota Natural Gas Transmission Co., St. Paul. A 500-mile line in North Dakota to include 78 miles, 12-in. from Tioga to Minot; 240 miles, 10-in. from Minot to Fessenden, Tokio, and Grand Forks; 15 miles, 8-in. from Tokio to Devils Lake; 70 miles, 6-in. from Fessenden to Jamestown; 95 miles, 10-in. from Jamestown to Fargo; 45 miles, 6-in. from Fargo to Wahpeton. The line would be built to handle a maximum of 29½ MMcf of gas per day. Cost: $10.8 million.

19. Northern Indiana Fuel & Light Co., Auburn, Ind. A 35-mile, 10¾-in. line from a connection with Panhandle Eastern Pipe Line Co.'s system near Edgerton, Ind. to Auburn, to serve the towns of Woodburn, Harlan, Grabill, Leo, Spencerville, St. Joe, Waterloo, Auburn, Altona, Avilla, and Kendallville. Cost (including conversion to natural gas from manufactured in the towns of Auburn, Garrett, Altona, Avilla, and Kendallville): $876,814.

20. Northern Natural Gas Co., Omaha. A 400-mile, 24-in. line extending from the international border in the northwest corner

of Minnesota to Farmington, just south of St. Paul, with two compressor stations totaling 10,560 hp. To serve existing utility customers. Cost: $24,630,000.

21. Northwest Alabama Gas District, Hamilton. A Y-shaped, 114-mile line connecting with Southern Natural's system at Moore's Bridge, Ala., to serve Winfield, Boston, Haleyville, Bear Creek, Hackleburg, Hamilton, Guin, Sulligant, and Brilliant. Will transport gas for city of Fayette.

22. Northwest Natural Gas Co., New York. A 665-mile line from Pincher station, Alta., to Pasco, Wash., consisting of 18-, 20-, 22-, and 24-in. line to serve the Inland Empire of eastern Washington and northern Idaho with some gas to be returned into Canada for use in Trail and elsewhere in British Columbia. Also 3520 hp in compression. Cost: $36 million.

23. Pacific Northwest Pipeline Corp., Houston. A system including 1466 miles of mainline from Ignacib, Colo., in the San Juan basin to Bellingham (Seattle area), Wash., with 380 miles of spur and lateral lines to make deliveries to Colorado Interstate near Rock Springs, Wyo., pick up reserves from Dry Piney (Wyo.) and Rangely (Colo.) fields, and serve Hanford, Yakima, Spokane, and Walla Walla, Wash. System to include 16 compressor stations with total of 104,420 hp. Cost: $186 million.

24. Philadelphia Electric Co., Philadelphia. Will spend $485,000 for new line in Philadelphia service area.

25. Tennessee Gas Transmission Co., Houston. A 243-mile, 24-in. line from an existing compressor station in the Hebron storage field in Potter county, Pa., extending across Pennsylvania, New Jersey, and New York to a connection with Northeastern Gas Transmission Co.'s system on the New York-Connecticut line near Greenwich, Conn., with a 28-mile, 24-in. spur extending south from the mainline in New Jersey to a connection with facilities of the Public Service Electric & Gas Co. near Newark and with Consolidated Edison Co. of New York's facilities near New York City. The new facilities would provide service to New York State Natural, Iroquois Gas Corp., Pennsylvania Gas Co., Inland Gas Corp., and Louisville Gas & Electric Co. In addition, Tennessee plans to serve four new companies: ConEd, Public Service, Brooklyn Union Gas Co., and Long Island Lighting Co. Cost: $33,677,000. A 50-mile, 10-in. lateral line in Texas. Cost: $1,575,000.

26. Texas Eastern Penn-Jersey Corp., Shreveport. A 265-mile, 24-in. line from Oakford storage in Westmoreland county, Pa., to a connection with the parent company, Texas Eastern Transmission Corp., system near Lambertville, N. J. Also includes a 3300-hp compressor station. Cost: $30,755,300.

27. Texas Gas Transmission Corp., Owensboro, Ky. A 24-mile, 16-in. line from South Roanoke, La. to Eunice, La.; 20 miles of 18-in. reconditioning line from Guthrie, La. compressor station to Bonita; and 1500 hp addition to Covington (Tenn.) compressor station. Cost: $1,925,300.

28. Trans-Canada Pipe Lines Ltd. A 2240-mile, 30- or 36-in. line across Canada from Alberta gas fields across the Prairies, around the Great Lakes to Ontario and Quebec with a line running off from Winnipeg to the U. S. border, 13 compressor stations totaling 94,160 hp. Cost: $300 million.

29. Transcontinental Gas Pipe Line Corp., Houston. A 421-mile loop line and 15,600 hp to be installed in new and existing compressor stations in Texas and Louisiana to enable it to increase natural gas deliveries to six customers in the New York City-New Jersey area by 93,490,000 cu ft per day. Loops would consist of about 190 miles of 30-in. and 231 miles of 36-in. line paralleling sections of Transco's existing system in Louisiana, Mississippi, Alabama, Georgia, North and South Carolina, Virginia, and Maryland. Cost: $53,058,013. Also, 57 miles of loop in Louisiana, Mississippi, and Alabama to enable it to transport a maximum of 10 MMcf/day on a firm basis for the Sun Oil Co. for use in its refinery at Marcus Hook, Pa. Cost: $6,533,000. And a 19-mile, 12-in. line in Vermilion parish, La., to enable it to take additional volumes of gas over a longer period of time from the West White Lake field. Cost: $1,042,310.

30. Trans-Northwest Gas Inc., Spokane. To build system of about 475 miles from connection with Westcoast Transmission Co. Ltd. at Osoyoos, B. C. south to Hanford, Wash., with line continuing east through Spokane to Trail, B. C. To serve Hanford Atomic Energy commission project at Hanford, Spokane, Coeur d'Alene, Kellogg, and Wallace, Idaho; Trail and Rossland, B. C. Cost $19,765,000.

31. Westcoast Transmission Co. Inc., Wilmington, Del. A system including 396 miles of line from the international boundary near Sumas, Wash. to Portland, Ore. with several short branch lines. To serve Bellingham, Everett, Seattle, Tacoma, Olympia, Centralia, and Longview, Wash., and Portland, Ore., and intervening communities. Cost: $19,370,000. Parent company, Westcoast Transmission Co. Ltd. of Canada, to build 923 miles of line from the Tangent gas field in Alberta to the international boundary near Sumas to include 29,040 hp in compression. Cost: $92,896,000.

COMPRESSOR HORSEPOWER (PLANNED)

Company	Add	New
American Louisiana Pipe Line Co.		30,000
Arkansas-Louisiana Gas Co.		10,500
Colorado Interstate Gas Co.		4,400
El Paso Natural Gas Co.		1,540
Kansas-Nebraska Natural Gas Co.	1,700	1,500
Manufacturers Light & Heat Co.	880	3,300
Michigan Consolidated Gas Co.		32,000
Michigan Wisconsin Pipe Line Co.	3,400	
Montana-Dakota Utilities Co.		2,640
Northern Natural Gas Co.		10,560
Northwest Natural Gas Co.		3,520
Pacific Northeast Pipe Line Corp.		104,420
Texas Eastern Penn-Jersey Corp.		3,300
Texas Gas Transmission Corp.	1,500	
Trans-Canada Pipe Lines Ltd.		94,160
Westcoast Transmission Co. Inc.		29,040
Total	7,480	330,880

COMPRESSOR HORSEPOWER (APPROVED OR UNDERWAY)

Company	Add	New
Atlantic Seaboard Corp.	4,400	
Cities Service Gas Co.	1,100	
Colorado Interstate Gas Co.		26,900
El Paso Natural Gas Co.		161,860
Gulf Interstate Gas Co.		40,000
Manufacturers Light & Heat Co.		4,400
Natural Gas Pipeline Co. of America	1,250	
Northern Natural Gas Co.	24,000	
Pacific Gas & Electric Co.	2,500	
Permian Basin Pipeline Co.	54,800	
Southern California and Southern Counties Gas Co.'s	5,850	
Tennessee Gas Transmission Co.	15,720	15,200
Texas Illinois Natural Gas PL Co.	10,000	70,000
United Fuel Gas Co.	3,000	7,700
Total	122,620	326,060

GAS staff report

A billion feet for Southern Natural

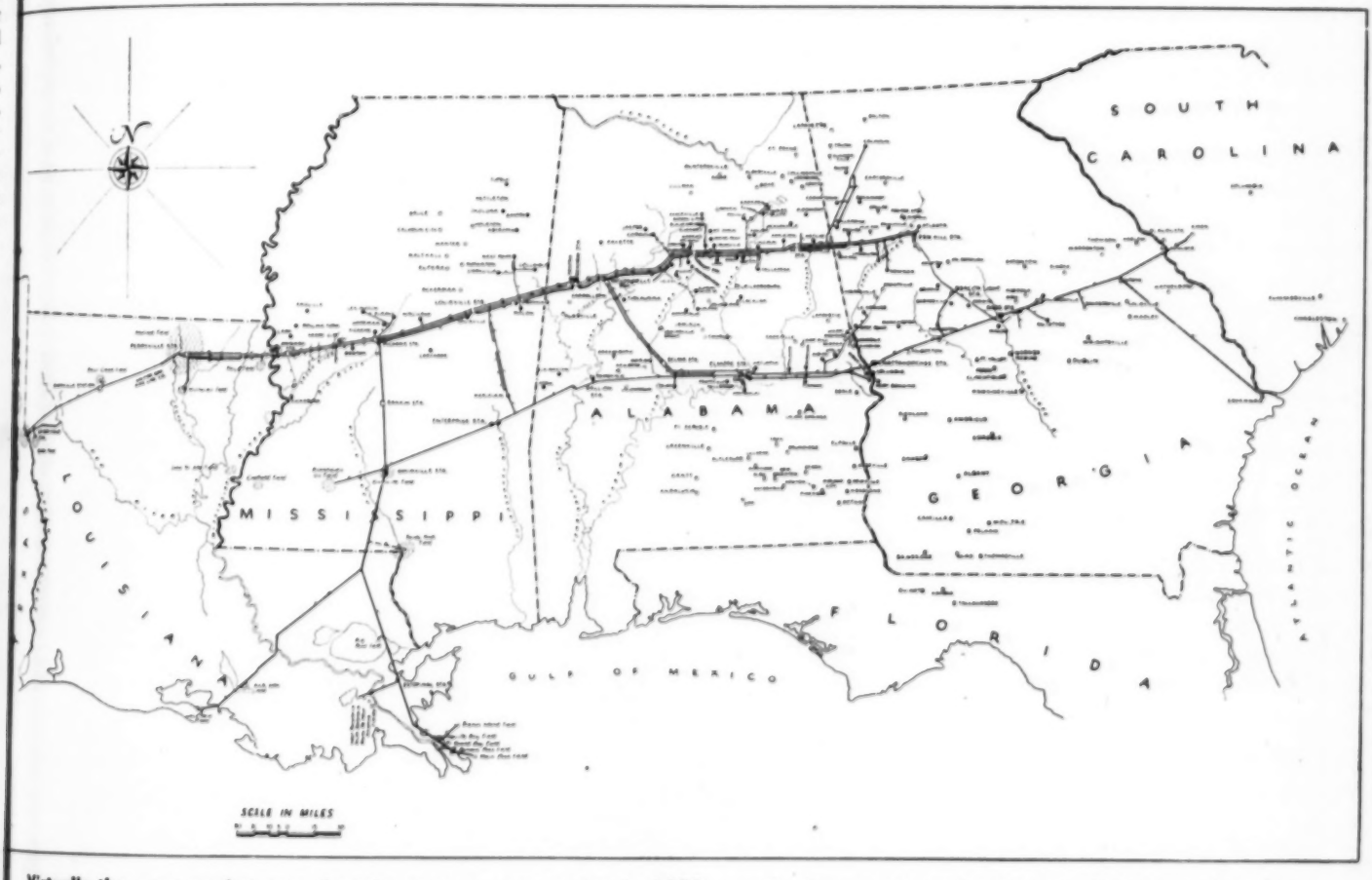
Pioneer Birmingham pipeline company celebrates quarter-century of service with an $83 million construction program that will boost its system capacity to ten times the early-day sendout.

By **FRANK CHAPMAN** • Editor

THE development of the industrialized southeast and the growth of the Southern Natural Gas Co., both over the past 20 odd years, is a remarkable study in sectional interdependence. No by-product of the industrialization of the section that it serves, the growth of the Southern Natural Gas Co. has provided the people and industry of the southeast with essential fuel in continually larger volume, without which the present state of industrialization would not have been achieved. As if to reciprocate, the natural resources, the labor supply, and the farsightedness of the section's business leaders have combined to provide an ever expanding market for the supply of natural gas delivered by Southern Natural.

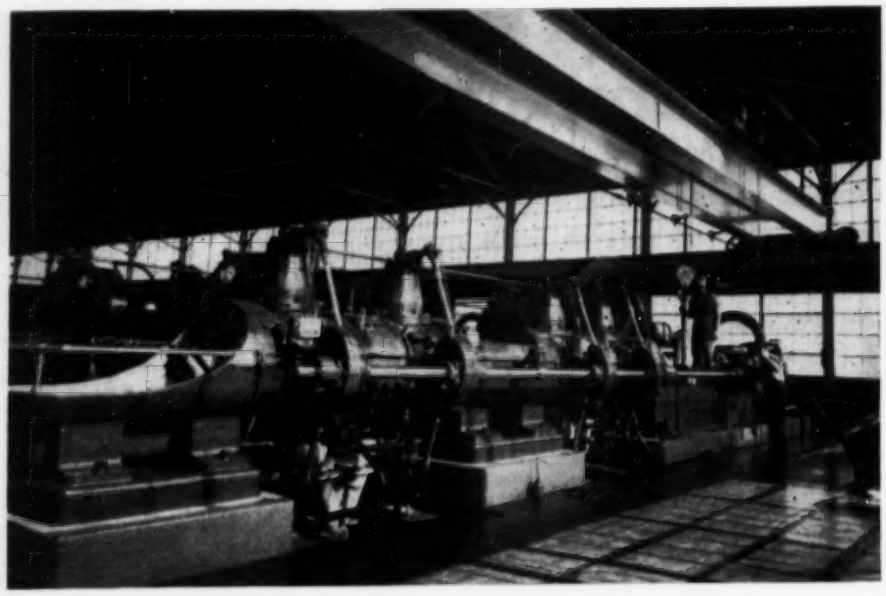
The story of the development of the southeast from an economically backward section to one which now rivals other historically industrial parts of the country has often been told. The story of the company and its farsighted executive family that has provided the means for this growth is not nearly as well known. It is the story of a group of men who had faith in natural gas as a fuel and in the future of the southeast as an industrial community.

This mutual growth and development has now culminated in a vast expansion program, started in 1952 and scheduled for completion in 1954, which will involve the expenditure of



Virtually the same market area that the company was serving in 1930 — with the exception of extensions that have since been made east of Macon, Ga. — is benefitting from the company's newest construction program. By intensively cultivating a well-defined market area rather than overreaching into "greener pastures," Southern Natural has been instrumental in fueling the growing industrialization of the Southeast. Current construction has included the supply lines in southern Louisiana, as shown on the map, and extensive looping and compressor additions.

The old...



These ancient Cooper-Bessemer engines are still giving dependable performance at Tarrant station, which continues to be a key point in the system.

upwards of $83 million by the company and see the system deliver over 1 billion cu ft of gas per day to its service area. The expansion program will involve the extension of gas supply lines into the gas-rich Mississippi delta region on the western flank of the system with eastern service lines fanning out to the Atlantic seaboard on the east.

This is a growth to over 4000 miles of pipeline in the ground with 22 compressor stations delivering approximately 160,000 hp which has stemmed from a meager start in 1930 when the company operated a bare 1250 miles of line with three compressor stations delivering the grand total of 15,000 hp. Although it was at the time one of the first long distance, high pressure lines in the country, the original Southern Natural system was a single line that extended from the Monroe and, since depleted, Richland fields in northern Louisiana to Birmingham, Atlanta, and Macon with a single lateral to Selma and Montgomery, Ala. Although it carried only 100 MMcf per day, its pressure of 400 psi was considered exceptionally high for its time.

Original service area

Of more than passing interest is the fact that the company's present 160-mile-wide by 650-mile-long service area is approximately the same as that originally serviced by the company in the early days of its existence. In 1930 this area included some 1.3 million persons. Today the same general area has grown to over 2 million persons with over 500,000 connected meters. The only major change in the service area was the company's recent expansion to Aiken, S. C., and Savannah, Ga.

Rates lower than 1930's

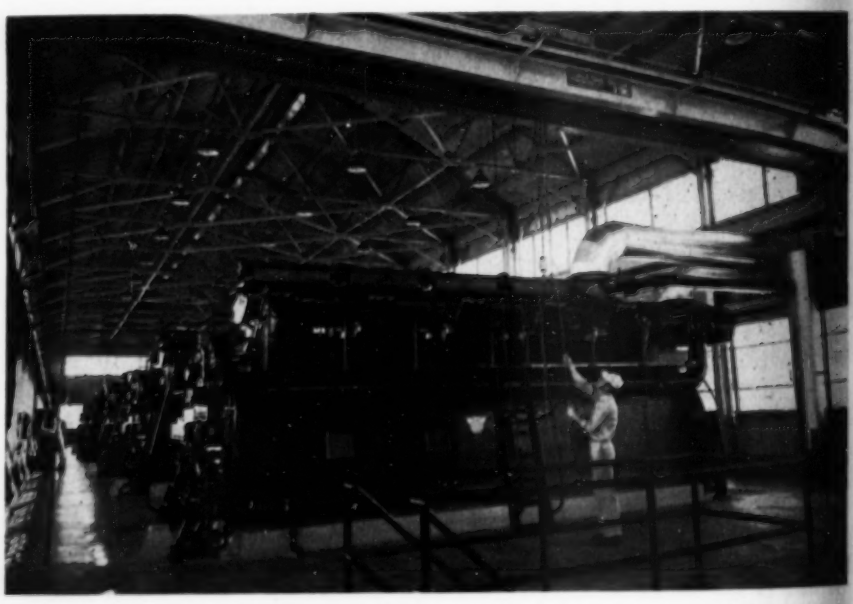
Another and still more remarkable fact is that Southern Natural is presently delivering domestic gas at a rate that is less than its original 1930 rate. This is still true even after approval of a recently filed rate increase. The company's rates have been reduced from time to time since its incorporation and the recent increase is the first that has been requested.

Early struggle

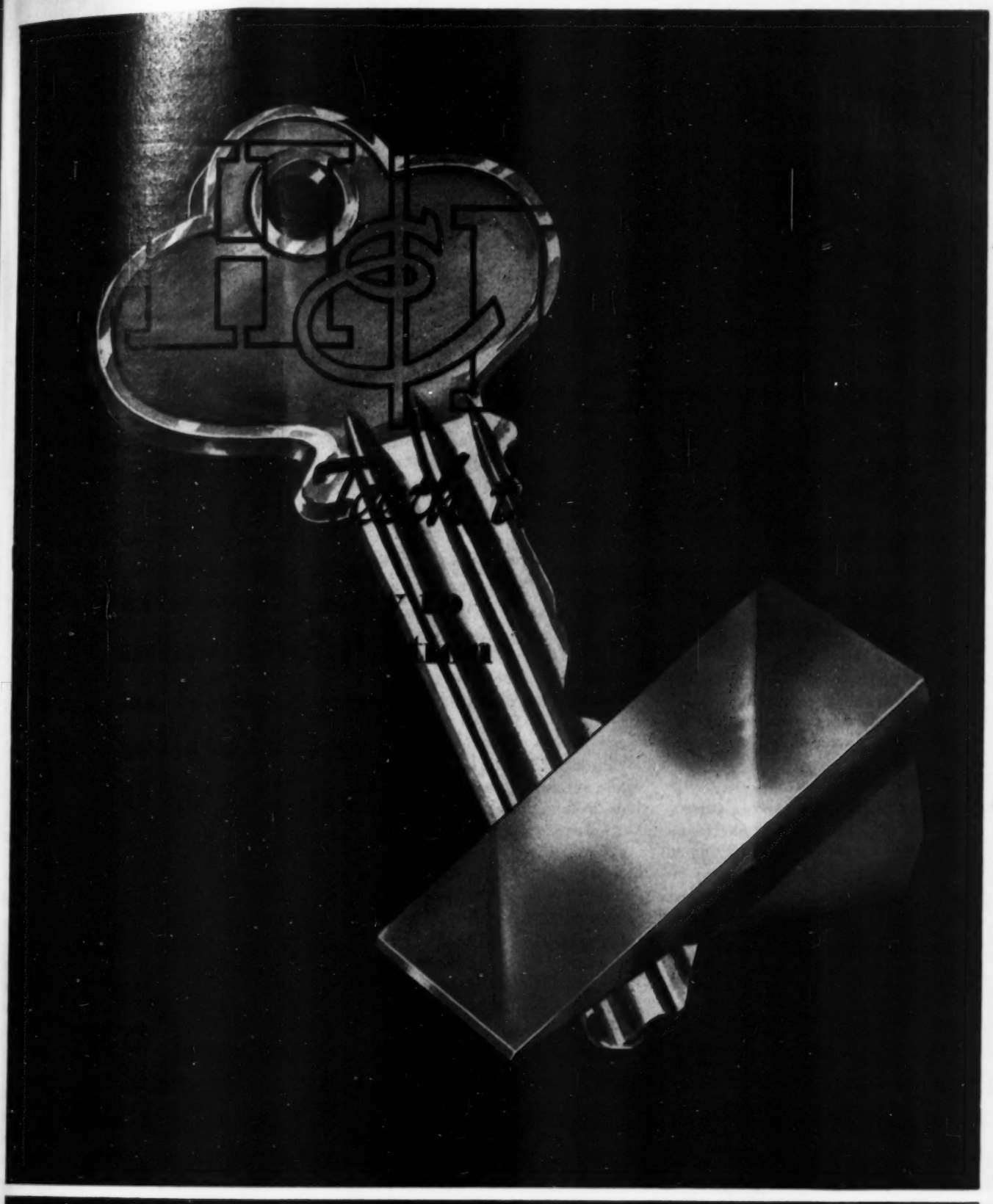
However, the growth of the company has not been as free from hardships as this record might make it appear. During the time the company was being formed, in 1928, there was considerable consternation among many persons about building a natural gas line to a section of the country that seemed to lag behind the rest of the nation in economic development. Besides this, the prospect of success became even more discouraging as the country was thrown into the depths of a great depression. It was at this time that the would-be prophets saw their predictions come true as the company, along with many other young businesses, was forced into receivership. It was on Jan. 1, 1936 that the Southern Natural Gas Co. emerged as a revitalized and going gas transmission company. The current expansion program is a monument to the men of vision who cut a path for the company through all these many hardships because of the simple fact that they had faith in the future of our southeastern states.

When gas first moved through Southern Natural lines in 1930, the company was supplying a mere 43 towns and cities. By 1936 the system

...and the new



Through Gwinville flows gas from principal supply areas in the immediate vicinity as well as from the new south Louisiana sources. Among the seven compressors pictured are three which were added recently as part of the company's current expansion program.



capacity had increased to 125 MMcf per day, additional engines had been added to the original three compressor stations, and two new stations had been added to the line. In 10 years, by 1941, the system capacity had doubled to deliver 215 MMcf per day, and in another seven years, by 1947, capacity had tripled and stood at 294 MMcf per day. From 1947 on the growth was even more remarkable with an increase of nearly 100 MMcf per day per year. The growth, however, was far more gradual and steady than it was glamorous. In 1950 the system delivery passed the half billion mark. It grew to 627 MMcf in 1951, to 710 MMcf in 1952, and in 1953 the capacity stood at more than eight times its original capacity with a daily load of 860 MMcf.

At the present time the load has pushed on upward to a maximum daily load of nearly 900 MMcf, which was registered on Jan. 12, 1954. Present authorized construction will round out a billion cubic feet per day to establish a daily load of 1020 MMcf.

The company's present service area consists of six distribution companies, 120 towns and cities, 55 municipalities or gas districts, and approximately 50 individual customers. Plant and property evaluation stands at $188 million.

Grid-like system

Prior to Southern Natural's current expansion program its grid-like transmission system consisted principally of two long distance lines, one about 80 miles south of the other, which reached from west to east across the company's service area. The two lines were connected at a series of points by lateral lines to allow for the interchange of gas flow to accommodate load changes.

The 460-mile north line, which originally extended from Perryville compressor station at the Monroe field in north central Louisiana to Atlanta and Macon, was extended westward in 1941 to Logansport field in western Louisiana in order to take gas from Logansport-Joaquin gas fields. The company's three original compressor stations were located on this line at Pickens, with 6500 hp; Reform, with 6500 hp, and De-Armanville, with 2000 hp.

A pioneer in the use of high pressure transmission lines, the company's Logansport-to-Perryville line was the first such line to operate at 1200 psi. This 131-mile, 14-in. line had a capacity of 100 MMcf per day—more than all of the original system.

The south transmission line approximately parallels the north line and extends from Gwinville compressor station to the city of Macon. It is a single 16- and 18-in. line that is designed to operate at 1200 psi, to establish another milestone in the use of high pressure gas transmission systems.

The two lines are cross-connected by a series of lines that provide for the interchange of gas as required by the company's varying load pattern. The cross connections are between Gwinville and Pickens stations on the western flank of the system, between Reform and Elmore stations in central Alabama, and between Atlanta and Macon on the east. In addition, Meridian, Miss., may be fed from either the north or south line, although there is no provision for a cross connection of the two lines through the city's distribution system.

Current expansion program

Southern Natural's current expansion program, which is expected to run through 1954, is budgeted at nearly $83 million for all construction and the acquisition of new facilities. The major portion of this program is included in one $76 million project. By the end of 1953 the company saw the completion of close to 1000 miles of pipeline ranging in size from 6 in. through 24 in. plus three new compressor stations with a total of 13,200 hp and the addition of 4350 hp to existing stations. Additional compressor capacity and some 250 miles of 18-in. line is expected to be installed during 1954 to bring the system total to over 4000 miles of pipeline with an installed horsepower of 160,000.

System capacity increased from 627 MMcf per day at the beginning of the current program in 1952 to 860 MMcf per day during 1953. Capacity will reach 1020 MMcf by the end of 1954.

Major undertaking of the new program that was completed during the past year is the nearly 400 miles of line extending into south Louisiana producing areas. Some 190 miles of this line is laid under water in canals through all-but-inaccessible marsh and swamp lands and to offshore producing areas in the open Gulf.

Extending south from Gwinville compressor station, the 24-in. line branches at Franklinton into 20-in. east and west legs. This portion of the program with its compressor facilities accounted for over $32 million of the total outlay.

The western leg extends from Franklinton junction, about 68 miles south of Gwinville, to Lake Sands field, which is located on the Gulf about 120 miles farther south. From Franklinton across the Mississippi to Duck Lake field the line is 20-in. while the remainder, an additional 20 miles to the Gulf, is 12-in. Four 12-in. lines cross the Mississippi at Carville, La.

East leg of the system is a 20-in. line that extends about 117 miles south from Franklinton across Lake Pontchartrain to some 60 miles of laterals in the lower delta. The 3300-hp Toca compressor station is located on this section of the line about 70 miles south of Franklinton. Gathering laterals on the end of each leg include about 20 miles of 16-in. line to the Main Pass offshore field, close to 20 miles of 12-in. to the Breton Island offshore field, and approximately 2.0 miles of 14-in. to Romere Pass field. A 12-in. lateral extends from about one quarter mile south of Toca station some 20 miles southwest across the Mississippi river to Barataria and adjacent fields.

With the exception of one lateral, all pipe from Gwinville south to the Mississippi river on the west leg and to the north shore of Lake Pontchartrain on the east leg was laid by Houston (Texas) Contracting Co. Ltd. The exception is 19 miles of 8-in. lateral that was put in by Southern Natural Gas Co.'s own crews from the Gwinville-Franklinton line east to Sandy Hook gathering field. Brown & Root Inc. laid both east and west legs of the system below the Mississippi and Lake Pontchartrain. Ford, Bacon & Davis Construction Co. served as engineers and made the two Mississippi river crossings.

South Louisiana

The south Louisiana project also included the new Toca compressor station with three 1100-hp Ingersoll-Rand KVG engines and the addition of three Cooper-Bessemer 1350 GMV engines to the Gwinville compressor station, to bring its complement to a total of seven Cooper-Bessemer engines. Also included in the project was the construction of a number of metering and receiving stations along the south Louisiana line. On the eastern end of the system, the current expansion program included 125 miles of new 16-in. line from near Macon to Augusta, Ga., and Aiken, S. C., with a 14-in. lateral extending from

this line some 112 miles to Savannah, Ga. The line was completed and put into use to Aiken on Dec. 1, 1953. It is at this point that the South Carolina Natural Gas Co. receives gas to serve Charleston and Columbia, S. C., and six small towns. The first gas was delivered through laterals to Savannah on Oct. 30, 1953. Major portions of this line were laid by Latex Construction Co. of Georgia. The eastern program accounted for an expenditure of over $10 million.

Included in this phase of the project was the construction of two new compressor stations; one at Ocmulgee near Macon, and the other at Ellerslie north of Columbus, Ga. The Ocmulgee station has four 1100-hp Cooper-Bessemer GMV engines and the Ellerslie station has five 1100-hp Clark engines.

Third loop

The final phase of the current program involves a third loop on the already looped north line. Designed to raise the system's capacity to the authorized 1020 MMcf per day, this part of the program is estimated in excess of $17 million. The 24-in. line, which runs between Pickens station in central Mississippi and a point near Atlanta, Ga., is designed for a working pressure of 750 psi. The construction was carried out by H. C. Price Co., Bartlesville, Okla., and Houston Contracting Co.

With the completion of this expansion program to add increased capacity to the system, the Southern Natural Gas Co. will be in a position to keep pace with the southeast's need for the fuel so vital to its continued growth.

Growth and addition of property and customers, however, is not the only criterion by which a company should be judged. As an organization of public service, a pipeline company is expected to show more attention to its attitudes and actions affecting workers, customers, and the community than the average business organization. A pipeline company must have that quality that in men would be called good character.

One of the indications of good character in a business organization is the manner in which the organization has interpreted the social, economic, and political environment of which it is a part, and how it has adapted itself to that environment. The government of Southern Natural over the past 20 odd years and its present continued expansion is eloquent evidence of how intimately the company is associated with its service area. The company's present situation indicates the extent to which it has been able to grasp the potentialities of the southeast and provide the means for its development.

A company feeling of responsibility toward its own family of workers is another indication of its inward quality. In its personnel relations, Southern Natural stands near the top throughout its service area as well as throughout the gas industry. The group life, hospital insurance and pension plans provided by the company for its employees are rated among the best. Its personnel enjoys limits of group life insurance as high as any in the industry and more than half of the premium is paid by the company. In the lower and middle income brackets this coverage is designed to provide life insurance equal to the employees annual pay for at least four years. The entire cost of the pension plan, which is underwritten by one of the largest insurance companies in the country, is borne by the company. The company pays one half the cost of home study courses satisfactorily completed by employees who wish to further their education outside of working hours. Length of service is recognized by the payment of a bonus to all except officers and senior administrative personnel. Bonus payments begin after five years of continuous service, give credit to initial date of employment and increase each subsequent year.

Cadet training

Also in line with the company's philosophy of personnel development is a cadet training program that has been in force since 1946. This program takes selected engineering graduates into the company, as needed, for supervisory training. So far some 20 men have joined the company in this way. The success of the program is indicated by the fact that such positions as assistant chief engineer, corrosion engineer, assistant corrosion engineer, assistant to superintendent of pipelines, assistant to superintendent of compressor stations, measurement engineer, planning engineer, rate engineer, and field engineer have been filled by men who satisfactorily completed the cadet training course.

Cadets are selected from college engineering graduates only after they have met, talked to and been approved by a majority of top company executives during visitation period or periods. Once a cadet has entered into the program he is given on-the-ground practical training by personally performing various duties in the different phases of the company's operations over a two-year period as follows:

Four months in the pipeline, compressor station, measurement and engineering departments; two months in the accounting department, and one month in the statistical and planning, land and lease, dispatching, sales and rate, personnel, and production departments.

Industry position

A company's position in its own industry is another measure of its character. The manner in which a company has forged ahead in an effort to develop new and improved techniques and practices is an indication of the interest it has in its own industry. Southern Natural Gas Co.'s pioneering of high pressure gas transmission lines is a typical example of this kind of character.

In 1941 the company built what is believed to be the first long distance high pressure line between Logansport and Perryville, La. This 130-mile, 14-in. line was designed for 1200 psi working pressure.

Success with high pressure lines led the company to follow this practice in more recent construction. The more recently built Gwinville-Pickens line was designed for 1000 psi working pressure and the new lines from the gas fields in south Louisiana and the line extending east from Gwinville to near Macon, Ga., are designed for 1200 psi working pressure.

As to the future, Southern Natural people feel that the place they have carved for themselves in the economic and social life of the southeast will provide them with an ever-expanding market for gas. Although the company purchases about 93% of the gas that it transports, a highly active exploration team is kept busy looking for new sources of gas. Because of the favorable labor market in the southeast and the proximity of raw materials to the area serviced by Southern Natural, the company is highly optimistic of its continued growth. As the southeast continues to grow, so will the Southern Natural Gas Co.

Design of the system →

Part 2. Design of the system as a model for the industry

THE highly flexible and integrated, grid-like transmission that characterizes the Southern Natural Gas Co. is in large part responsible for the manner in which the company has been able to keep up with the constantly increasing load presented by its service area while, at the same time, holding the line on the cost of gas to the consumer. System capacity has been increased from 100 MMcf per day in 1930 to a present daily load of nearly 1000 MMcf. This load supplies a service area that has experienced a population increase of from 1.3 million persons to about 2 million persons over the same period at a domestic rate that is lower today than it was in 1930.

This growth has been made possible by a system design wherein the flow of gas can be readily altered as required by load conditions throughout the service area. By taking advantage of large interruptible industrial loads that may be taken off the line on short notice, the company has been able through the years to maintain a constant 75% to 80% or better load factor. Basically, the transmission system is designed for winter domestic load peaks.

In working out the system design a number of unusual features have been brought into play—many of which have served as guide posts for the gas industry as a whole. Among these are the use of high pressure lines, in which the company pioneered; flexibility in the design of compressor stations, and a dispatching system that is centralized and designed for a high degree of mobility.

The system really begins with the 75-mile, 16-in. north-south line between the Gwinville and Pickens compressor stations in central Mississippi. Gas enters the system from the company's south Louisiana lines and two other fields in lower Mississippi at Gwinville where it can either be dispatched to Pickens and the north line or directly east on the south line. Gas entering the system at Pickens station originates in gas fields in Texas, north central and western Louisiana and is brought in by looped lines through Logansport, Bienville, Perryville, and Onward compressor stations. Pickens feeds this gas into two of the three north lines, and regulates the supply from Gwinville to 750 psi for the third north line.

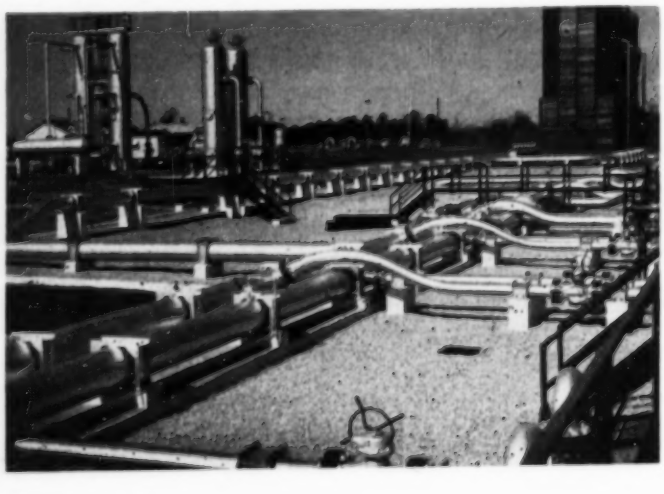
Gwinville has capacity to receive some 300 MMcf per day at 700 psi and above from the company's south Louisiana system. This originates in the delta and offshore gas fields in south Louisiana, and in the Sandy Hook field in southern Mississippi. In addition, Gwinville station receives from Gwinville field some 300 MMcf per day at 1000 psi and delivers some gas for repressuring to the Brookhaven oil field, located some 30 miles to the southwest of the station.

Gwinville station can discharge gas north to Pickens at 1000 psi or east on the south line at 1200 psi. Because of the high pressure gas arriving at the station, piping is so arranged that compression may be used or the station may be bypassed. When compression is used the station's bank of compressors may be used as either single- or double-stage units.

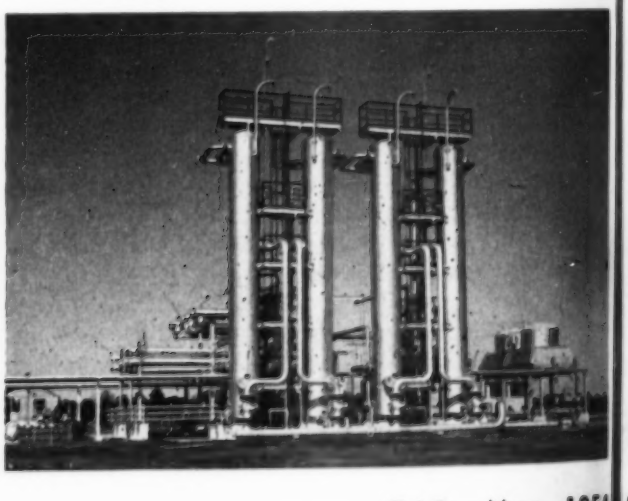
The north transmission line of the system is a triple line to beyond Birmingham with single and double loops extending on to Atlanta. The older two of these lines, varying in size from 20 to 24 in., operates at 500 psi and the newer one, a 24-in. line completed as a part of the current expansion, is designed for 750 psi. The 380-mile, 1200-psi south line reaches east from Gwinville to Macon, Ga., and the eastern seaboard. The grid-like nature of the system is completed by a series of three parallel cross connections.

Of particular interest in the design of the system of transmission lines is the use of the third north line—the new 750-psi line that receives gas from the south—as a "high tension" line to replace gas supplied to laterals by the other two north lines. At the present time no gas is taken off the 750-psi north line until it passes Birmingham and the point where Gadsden, Ala., laterals take off from the two lower pressure north lines. This is a point about 30 miles beyond Tarrant compressor station. With the single high pressure line of the three acting as a "through" line, all laterals between Pickens station and the junction point are supplied

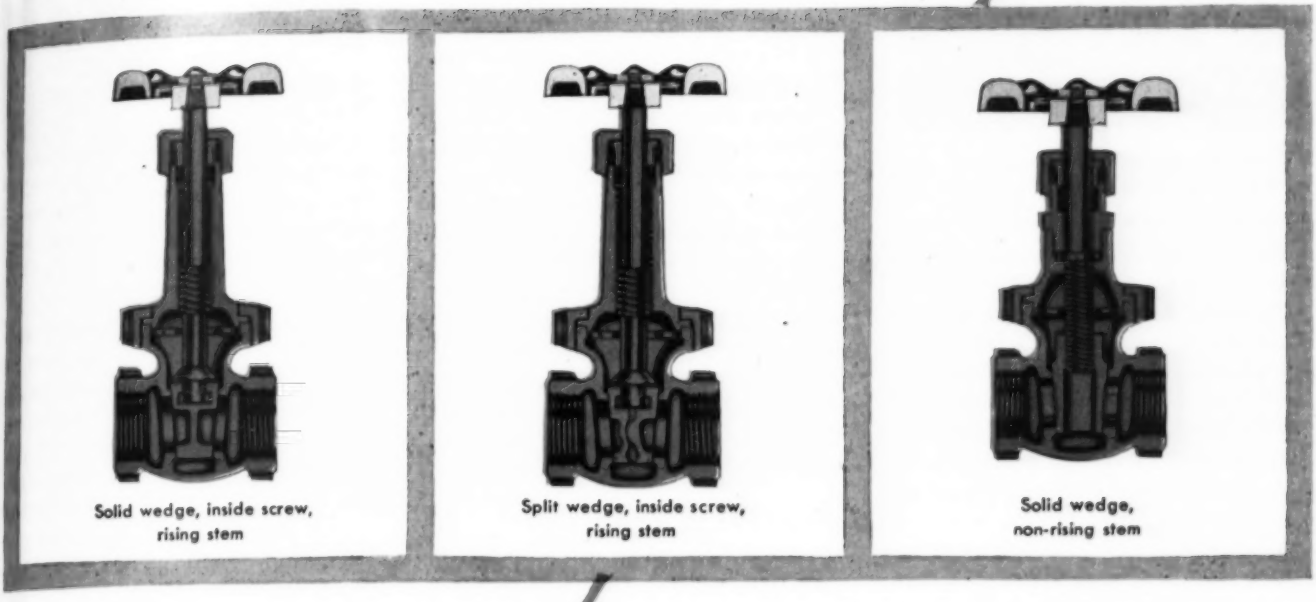
Piping at Gwinville station, showing discharge lines from compressor pump over suction header and into discharge header. Piping was designed by Fluor. Elevated discharge line in center goes to the three-cell Fluor cooling tower in right background. Absorbers and scrubbers are shown on the left.



Four new absorbers built by J. F. Pritchard Co. at Gwinville. Lines coming in overhead from left carry Dowtherm from boiler house to heat exchangers behind first pair of absorbers. Two of four cooling towers (right) are used to cool gas after it has been through the reactivation process.



Oh, I see



Solid wedge, inside screw, rising stem

Split wedge, inside screw, rising stem

Solid wedge, non-rising stem

. . . we've added 125 and 150 lb. bronze gate valves to our union bonnet line

WORKING PRESSURES
125 lb. W. S. P. 400° F.
150 lb. W. S. P. 400° F.

Success of our 200 lb. line of union bonnet bronze gate valves necessitates expansion of the line to include 125 lb. and 150 lb. classes. Sizes range from ¼ to 2 inches.

NOTE THESE ENGINEERING FEATURES:

This line has a flat seat on the bonnet which mates against the body, providing adequate bearing area for sealing.

Tight bonnet joint, but easy access to interior for inspection and service.

Full ports permit unobstructed flow.

Back-seating arrangement permits repacking while under pressure.

Split wedge has ball in socket contact . . . permits wedge to adjust itself to seat.

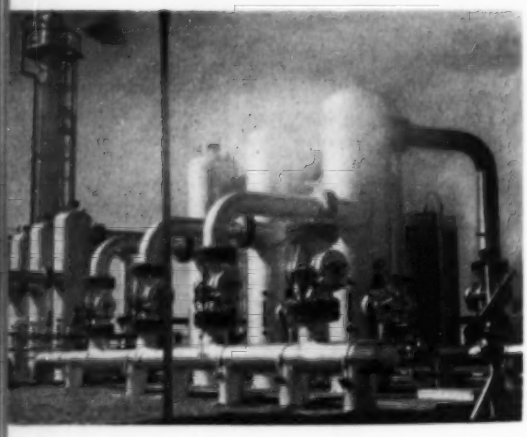
Slip-on type "T" head stem-to-wedge connection.

Lug-type hexes make valves compact and provide a better wrench-gripping surface.

To learn more about this expanding line of valves, write for our *Union Bonnet Bronze Gate Valve Catalog Folder.*

THE OHIO INJECTOR COMPANY • WADSWORTH, OHIO

VALVES | **FORGED & CAST STEEL, LUBRICATED PLUG, BRONZE & IRON**



A bank of seven scrubbers on the line from local gathering fields at Gwinville.

solely from the two lower pressure lines.

Four compressor stations located along the north line—Pickens, Louisville, Reform, and Tarrant—are so designed that the two lower pressure lines may be isolated from the high pressure line and separate compressors used on each. Such versatility in the design of station piping indicates the way the company has been able to keep up with a growing load pattern. It is possible to take gas from the high tension line into either or both of the lower pressure lines at any one of the compressor stations along the line if it should be required because of an unusual load condition, any change in the load pattern, or because of some emergency requirement. This is done by taking from the suction of the high pressure line into the discharge of the lower pressure line without compression, and is made possible by locating crossover points according to pressure loss.

The system of lines that cross-connect the parallel north and south lines is another example in flexibility in design. The city of Meridian, Miss., for example, can be supplied from either the north or south lines according to the load pattern throughout the remainder of the system. Although the load presented by Meridian is relatively minor, it does provide a degree of flexibility in dispatching that can be used to advantage in supplying other larger loads. Since no provision is made for cross-connecting the two lines through the city's distribution system, gas cannot be taken from one of the lines into the other.

In the looped line between Reform station on the north line and Elmore station on the south line, however, and in the single line between Atlanta and Macon, gas can flow in either direction from one line to another as required by the load presented to the system. In fact, on the looped line it is possible to have gas flowing in one direction in one of the lines and in the opposite direction in the other at the same time. This, however, is an unusual condition that would not ordinarily be used.

Toca and Gwinville stations each have 12 houses of this kind prefabricated by Southern Mill. They cost a total of something more than $60,000.

Direct supply line

In practice the south line is usually used during the summer months as a direct supply line to industrial loads in Savannah, Augusta, and Aiken. During this time no lateral loads are taken off the line west of Augusta. Atlanta, Birmingham and other loads through Mississippi, Alabama, and Georgia are supplied altogether from the north line. During heavy load weather in the winter, however, a portion of the load is supplied by each of the lines. During extreme load conditions, the industrial interruptible loads are taken off the line as required and the entire service area served by both lines.

It is obvious that an extreme degree of flexibility is required in coordinating the dispatching of a system of this nature. The dispatching is done by telephone and radio from the company's headquarters building in Birmingham.

An interesting example of the manner in which the flexibility of gas dispatching can be utilized to provide for heavy loads is the interconnection between the Southern Natural system and Transcontinental Gas Pipeline Corp.'s mainline to New York City near Selma, Ala., and Atlanta, Ga. Emergency or excess gas can be delivered to or taken from Transco near Selma and in turn Southern can receive or deliver gas through the intersection with Transco near Atlanta.

The Southern Natural north line presently has a through-put capacity of about 645 MMcf per day and the south line a daily capacity of about 25 MMcf. Upon completion of the current program, however, the capacity of the north line will be increased to 71 MMcf and the south line to 340 MMcf per day. After deducting fuel gas this will result in the total authorized system capacity of 1020 MMcf per day. Capacity taken by the line east of Aiken, S. C., is 106 MMcf per day with an input pressure of 904 psi and a terminal pressure of 400 psi. The Savannah line delivers 56 MMcf per day at an initial pressure of 655 psi and a terminal pressure of 200 psi. Ultimate capacity of the line extending east from Ocmulgee compressor station near Macon, Ga., is 133,000 MMcf.

Two new compressor stations have been added to the eastern section of the system to handle the increased load to central Georgia and the Atlantic seaboard. These are the 5500-hp Ellerslie station on the south line near Columbus, Ga., and the 4400-hp Ocmulgee station near Macon at the junction of the south line and the extension of the north line from Atlanta.

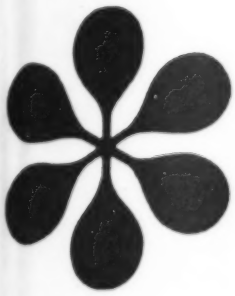
Ocmulgee station has four 1100-hp Cooper-Bessemer GMV turbo-flow engines equipped with AAF air filters and Maxim silencers. Compressed gas, oil and engine-jacket cooling water are cooled in a Fluor induced-draft cooling tower. Station auxiliary power is supplied from a 210-kw General Electric generator driven by an Ingersoll-Rand PVG six-cylinder engine. The station is equipped with a Permutit water treatment plant.

Five compressors

Ellerslie compressor station has five 1100-hp Clark HVA engines, and Fluor induced-draft cooling tower. Both stations are equipped with Stearns Rogers gas scrubbers. Six houses for station personnel, prefabricated by Southern Mill and Manufacturing Co., Tulsa, are provided at each of the two stations.

Remaining compressor installations in the current program include three 1100-hp Ingersoll-Rand KVG engines at the new Toca station on the east leg of the south Louisiana line, first operated on Dec. 1, 1953; and the addition of three 1350-hp Cooper-Bessemer GMV engines at Gwinville station to bring the station total to seven Cooper-Bessemer engines with a total of 9200 hp.

Of particular interest is the fact that



Southern Natural Gas Company has again demonstrated its confidence in the continuing growth of the South!

*** Our heartiest congratulations are extended to its progressive management, for the foresight displayed in the planning and construction of these new facilities.**

*** We are proud to have been selected to participate in the construction of pipe lines and stations in this great program.**

For more than twenty years, the name LATEX has meant honesty and integrity in the construction of pipe lines and station facilities.

INTEGRITY

TERMINALS
PUMP STATIONS
COMPRESSOR STATIONS
TANK & STATION
SANDBLASTING & PAINTING

LATEX
CONSTRUCTION COMPANY OF GEORGIA

OIL LINES
GAS LINES
GASOLINE LINES
WATER PIPE LINES

EXPERIENCE

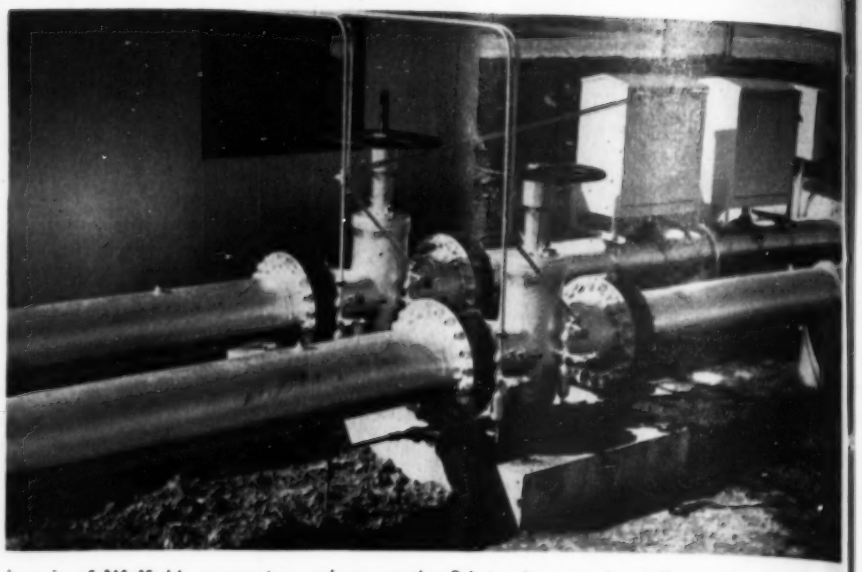
BOX 56, NORTHSIDE BRANCH, ATLANTA, GEORGIA • TELEPHONE CHEROKEE 9414

all new compressor stations have full basements containing all fuel, air and oil lines to the compressor engines. All of the new stations are constructed in such a manner that additional facilities may be conveniently added. Toca station, which is located in the Louisiana marsh country south of New Orleans, is built on 55-ft piles driven into the not-too-solid ground. The 20-in. east leg comes out of its canal about a quarter mile south of the station and reenters the canal again a short distance north.

Water treatment plant

Because of the lack of a suitable water supply at Toca station it was necessary to incorporate an elaborate water treatment plant as a part of the design. This plant, designed and built by Infilco Inc., Tucson, Ariz., is located in a separate building on the station grounds. The treatment building contains a large mixing tank and two small filter tanks. The operation of the equipment is fully automatic with lime being fed into the large mixing tank and the tank operated as required to maintain lime in the proper proportion. Engine jacket water is given additional treatment to retard any possible fungus growth. Domestic water is stored in a 10,000-gal. tank and station water in a 100,000-gal. tank, both made by the Chicago Bridge and Iron Co.

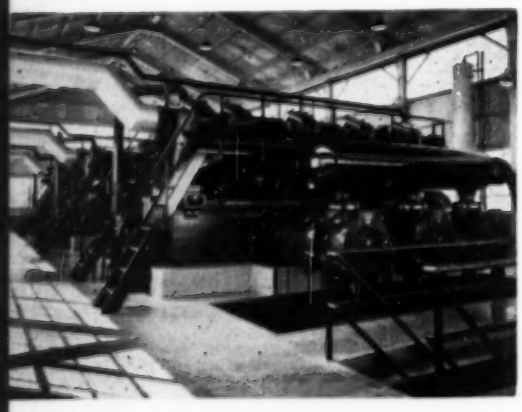
Compressor engine suction and discharge piping at both Toca and Gwinville was designed and prefabricated by the Fluor Corp. Pulsation dampening techniques were used to minimize vibration set up by pulsative flow of gas from the reciprocating engines. Because of the high pressures at which these two stations are designed to operate, a pulsation dampening system is particularly desirable. Its application results in less danger of line breakage due to fatigue, less frictional loss in the flow of gas, and an improvement in metering. The design involves gas suction and discharge bottles, headers and laterals installed as a part of the station piping.



A pair of W-K-M measuring valves on the 24-in. line south of Gwinville. Differential reading lines can be seen leaving each of the valves and entering the measuring house in the background.

At Gwinville station 8-in. suction and discharge lines are used on three engines and 14-in. lines on the other four, while at Toca the discharge line is 6 in. and the suction line 8 in. Twenty-inch headers are used at both stations. A Fluor-designed pulsation dampening system was also installed at the Ellerslie and Ocmulgee stations during 1953 and at Logansport station during 1952.

All major lines in the south Louisiana system south of Gwinville are designed with full opening valves and pig receiving and sending traps. A representative installation is located just south of Toca station where the West Barataria lateral meets the mainline from the south. At this point there is a Thornhill-Craver Unibolt hinged scraper trap and measuring facilities on both the 20-in. south line and the 12-in. lateral. Both lines are connected through W-K-M full opening, motor-controlled valves to pig receiving barrels; the 20-in. barrel and the 12-in. lateral to a correspondingly larger barrel. A Nordstrom Hyperseal plug valve ahead of the W-K-M feeds gas into a metering header and single meter run. The downstream meter run header is connected through another Nordstrom plug valve to the 20-in. station line. A 16-in. line, which takes off between the W-K-M and the Nordstrom on the upstream side of the meter run, can be used to bypass the meter run through a third Nordstrom plug valve. Both E-I-M and Limitorque valve operators are used on the W-K-M full opening valves. Of the 29 E-I-M controllers on the line, nine are of the self-submersible type and are expected at times to be completely under water. On pig-receiving traps a bypass line is located between a point at the rear of the trap barrel and the 16-in. bypass line to bypass gas as the pig is brought into the trap. On pig-sending traps a similar line is connected to a point near the opening of the pig trap to provide sendout gas pressure for the pig.



Interior of compressor building at Toca showing three Ingersoll-Rand compressors. Engines are fitted with Fluor pulsation dampeners. Stairway in foreground goes to station basement, which contains oil, fuel, and jacket water lines, as well as oil filtering equipment.

Two meter runs

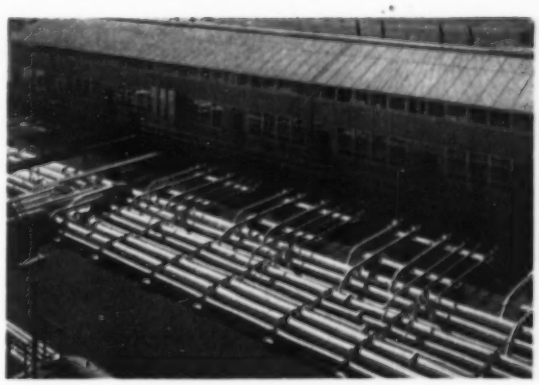
One meter run is provided on the 20-in. mainline south of Toca and one on the Barataria lateral. The headers on these south Louisiana lines are provided with additional nozzles for another run. Similar metering installations are located on the west leg 20-in. (Duck Lake line) and the east leg 20-in. (Delta line) at their junction at Franklinton. The meter runs are provided in a similar arrangement at the metering and receiving point south of the Gwinville station. At these locations the measurement is done with metering gate valves, a new development by Southern Natural. These valves are of a

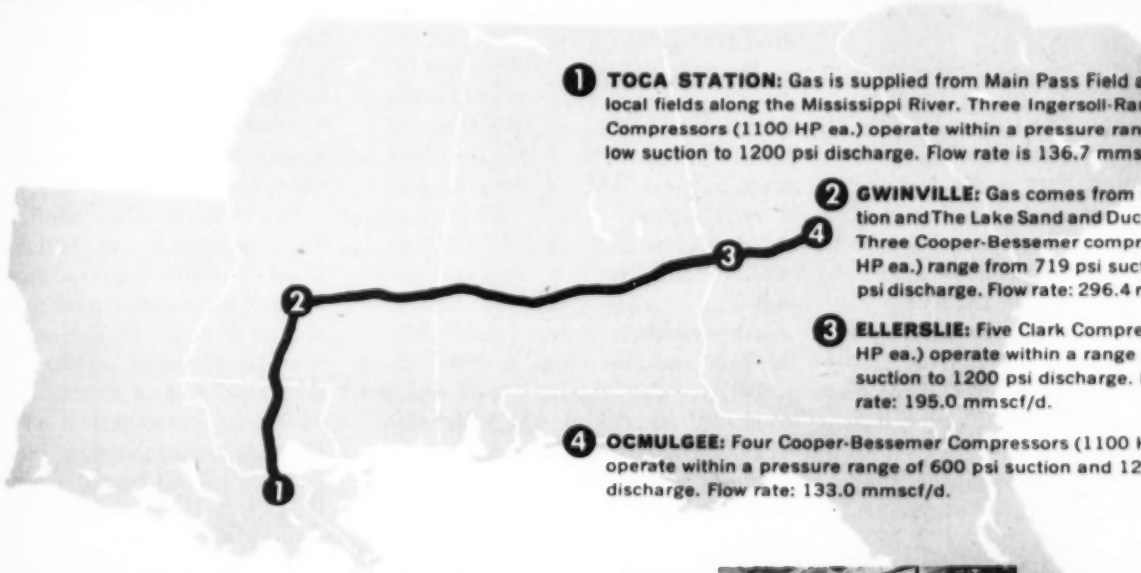
Designed to stop compressor-plant vibration–

Fluor pulsation dampener piping systems

have been installed by Southern Natural Gas in 4 new compressor stations

Southern Natural Gas Company has added four new compressor stations on their high pressure gas transmission system, which begins in Southern Louisiana and crosses the states of Mississippi, Alabama, Georgia, and extends into South Carolina. The company installed complete prefabricated Fluor Pulsation Dampening Systems in the four stations. A Fluor Pulsation Dampening Piping System had previously been installed at their Logansport, Louisiana, unit in 1952. Each new station has engines operating at a maximum of 1200 psi discharge under different conditions. The Fluor piping systems were individually designed, engineered and built into complete units to satisfy the specific conditions of each station.





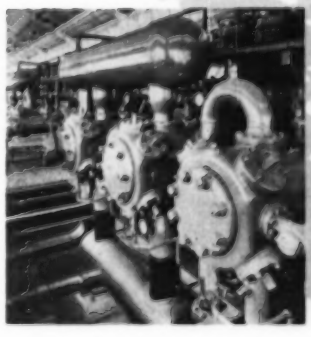
1 **TOCA STATION:** Gas is supplied from Main Pass Field and other local fields along the Mississippi River. Three Ingersoll-Rand Compressors (1100 HP ea.) operate within a pressure range of 600 psi low suction to 1200 psi discharge. Flow rate is 136.7 mmscf/d.

2 **GWINVILLE:** Gas comes from the Toca station and The Lake Sand and Duck Lake Fields. Three Cooper-Bessemer compressors (1350 HP ea.) range from 719 psi suction to 1200 psi discharge. Flow rate: 296.4 mmscf/d.

3 **ELLERSLIE:** Five Clark Compressors (1100 HP ea.) operate within a range of 600 psi suction to 1200 psi discharge. Flow rate: 195.0 mmscf/d.

4 **OCMULGEE:** Four Cooper-Bessemer Compressors (1100 HP ea.) operate within a pressure range of 600 psi suction and 1200 psi discharge. Flow rate: 133.0 mmscf/d.

The Fluor Pulsation Dampener Piping System is the newest and most practical approach to pulse-free piping yet developed. Furnished in prefabricated form, ready for installation, it is built to eliminate pulse-peak pressures and piping vibration caused by reciprocating compressors, to provide a smooth, steady gas flow. Metering inaccuracies are significantly reduced, operating efficiency is increased, as is plant safety, and maintenance costs are cut to a minimum. Designed primarily for new construction, a Fluor Pulsation Dampener Piping System is comparable in first costs with conventional piping systems.



BE SURE WITH **FLUOR**

THE FLUOR CORPORATION, LTD
LOS ANGELES 22, CALIFORNIA

FLUOR OF CANADA - TORONTO
FLUOR INTERNATIONAL - BEIRUT
FLUOR PERUANA, S.A. - LIMA
HEAD WRIGHTSON - LONDON

ENGINEERS
CONSTRUCTORS
MANUFACTURERS

NEW YORK
CHICAGO
PHILADELPHIA
BOSTON
PITTSBURGH
SAN FRANCISCO
HOUSTON
BIRMINGHAM
TULSA

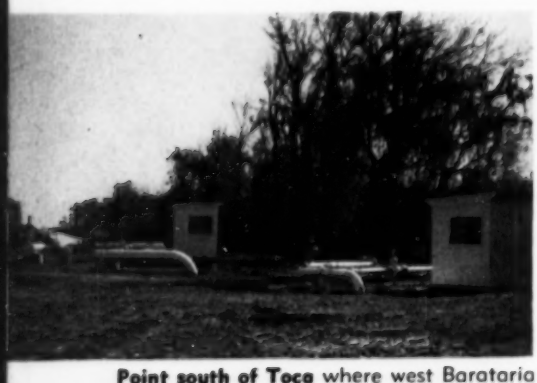
FOR MORE INFORMATION *on the full advantages of this guaranteed piping system, write for Bulletin PDS-8501.*

modified venturi type and were manufactured to Southern Natural's specifications by W-K-M Co. Pressure differential is taken across the upstream side of the valve and a point in the valve throat and recorded by a standard orifice meter housed adjacent to the valve.

Southern Natural has had 16 of these metering valves made up, ranging from 4-in. to 14-in., eight of them being of the latter size. These are used for metering pipeline volumes at various points on the newly built pipe system, at the same time serving as valves on lines or assemblies where an ordinary valve would otherwise have been required. Southern Natural's measurement department has had the development of this new primary device for metering pipeline volumes under research and extensive laboratory test work for several years, resulting in a metering gate valve with measurement accuracy reported to be comparable to that of the flat plate orifice, but with much higher capacity and negligible overall pressure loss.

The flexibility of the system is no better shown than in the design of the Gwinville station, which, because of its strategic location at the junction of the two main supply lines to the east and north, is a key point in the control of the flow of gas to the entire system from south Louisiana and other gathering fields in the area. Because the station also receives gas from its own local producing area, the installation includes a rather extensive hydrocarbon control plant. (See page 134 for station diagram.)

Total compressor complement of the station is seven Cooper-Bessemer engines, with four GMV 10 turbo-flow engines installed and put into operation on Dec. 1, 1952, when the station first went on the line, and three Cooper-Bessemer GMVA 10 engines installed and on the line in October 1953. The station delivers a total of 9200 hp.



Point south of Toca where west Barataria line meets main 20-in. line from lower delta gather fields. In left background can be seen man-made canal where line comes in from south. Pig receiving trap and measuring run on this line on left; Barataria lateral comes in from right and another canal, pig trap and measuring run are shown at right. Two houses contain measuring equipment.

Basically, the station is so designed that gas may be taken from either the south Louisiana line or from local gathering fields and sent out into the system through north and east lines as the load demands. Four of the engines make up one bank while the remaining three make up the other. The middle engine of the group (No. 4 on page 134) can be completely isolated and is presently used on an 8-in. supply line from the United Gas Corp. Piping is arranged to permit double-stage compression with the discharge of some of the engines feeding the suction of another bank. If desired, it is also possible to completely bypass the station compressors.

High pressure gas is received from local fields through two 8-in. and two 12-in. gathering lines. The station hydrocarbon control plant takes off these lines at the first-stage separator. Gas from the local fields is fed into both north and east lines through a bank of seven scrubbers. Four scrubbers feed the north line and three the east line. All are Black, Sivalls & Bryson scrubbers with a 50-MMcf capacity. Following the scrubbers there are four 42-in. by 36-ft and two 60-in. by 30-ft absorber type dehydration vessels with a combined capacity of 400 MMcf/day. The dehydrators and associated heat exchangers and coolers for reactivation were designed and installed by J. F. Pritchard & Co. Two Quintar fan units for cooling reactivation gas were made by J. F. Pritchard. Because the pressure of this field gas is as high as 1000 psi, it can be put directly into either of the two outgoing lines without compression.

A side stream of inlet gas passes through heat exchangers against hot outlet reactivation gas from the adsorbers, hence to reactivation gas heaters where 530° F Dowtherm vapors are used as the heating medium. Outlet reactivation gas is further cooled and water vapors condensed in aerial coolers after passing through the heat exchangers. The wet reactivation gas then re-enters an on-stream adsorber for drying and recombining with the main gas stream.

One of the 29 E-I-M controllers installed on a W-K-M full opening gate valve.

If, however, single-stage compression is required to feed the 1200-psi east line from the Gwinville field, gas is taken off this line on the downstream side of the receiving and measuring station and applied to the suction headers of as many engines as needed to handle the load. These engines then discharge into the east line just downstream from the point where suction was taken.

Gas from the 24-in. south Louisiana line is brought into the station through a pair of Stearns Rogers scrubbers. This gas may bypass the station compressors and go directly into the east transmission line. However, because of the pressure drop south of Gwinville single- or double-stage compression is usually applied. When double-stage compression is used, gas discharged from the first stage is cooled in a three-cell Fluor cooling tower before it is applied to the suction of the second stage. Water from the same cooling tower is used for cooling the oil and jacket water for the engine.

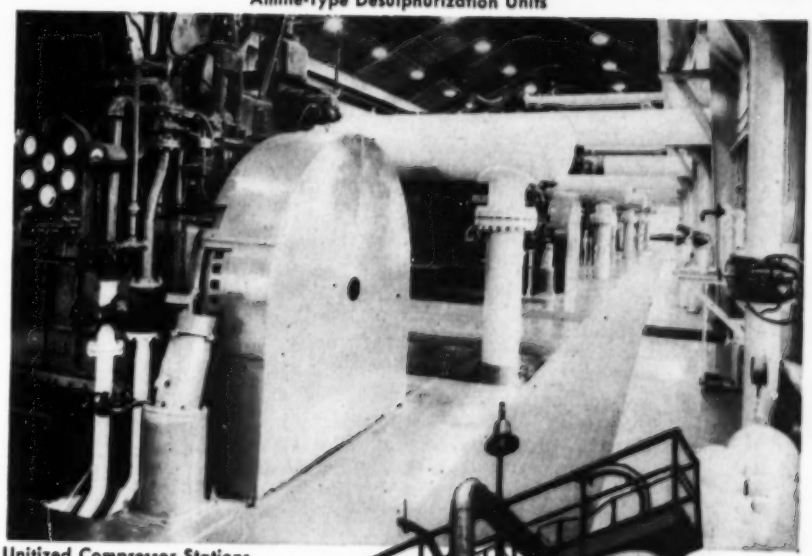
Gas for the reactivation process is heated with Dowtherm. The Dowtherm, heated in a bank of four gas-burning furnaces, will develop a temperature of some 530° F at a pressure of 15 to 17 psi. It is used to heat reactivation gas in a set of heat exchangers. Hot gas that has been used in the reactivation process is used to preheat the gas going into the Dowtherm heat exchangers. This process takes place in another set of heat exchangers. After the spent reactivation gas has been through the pre-heaters it is cooled and water extracted in a set of fan coolers.

Construction in south Louisiana →

TREAT IT RIGHT!

Naturally, you get more production . . . more profit . . . from gas treating facilities of modern, compact, efficient design. Pritchard has proved its exceptional ability — earned and learned through long experience — to engineer and construct such dependable installations for the gas industry. If you want to treat it right, let Pritchard know-how solve your gas treating problems.

Amine-Type Desulphurization Units



Unitized Compressor Stations

Industry's Partner for Progress

J.F. Pritchard & Co.
ENGINEERS · CONSTRUCTORS

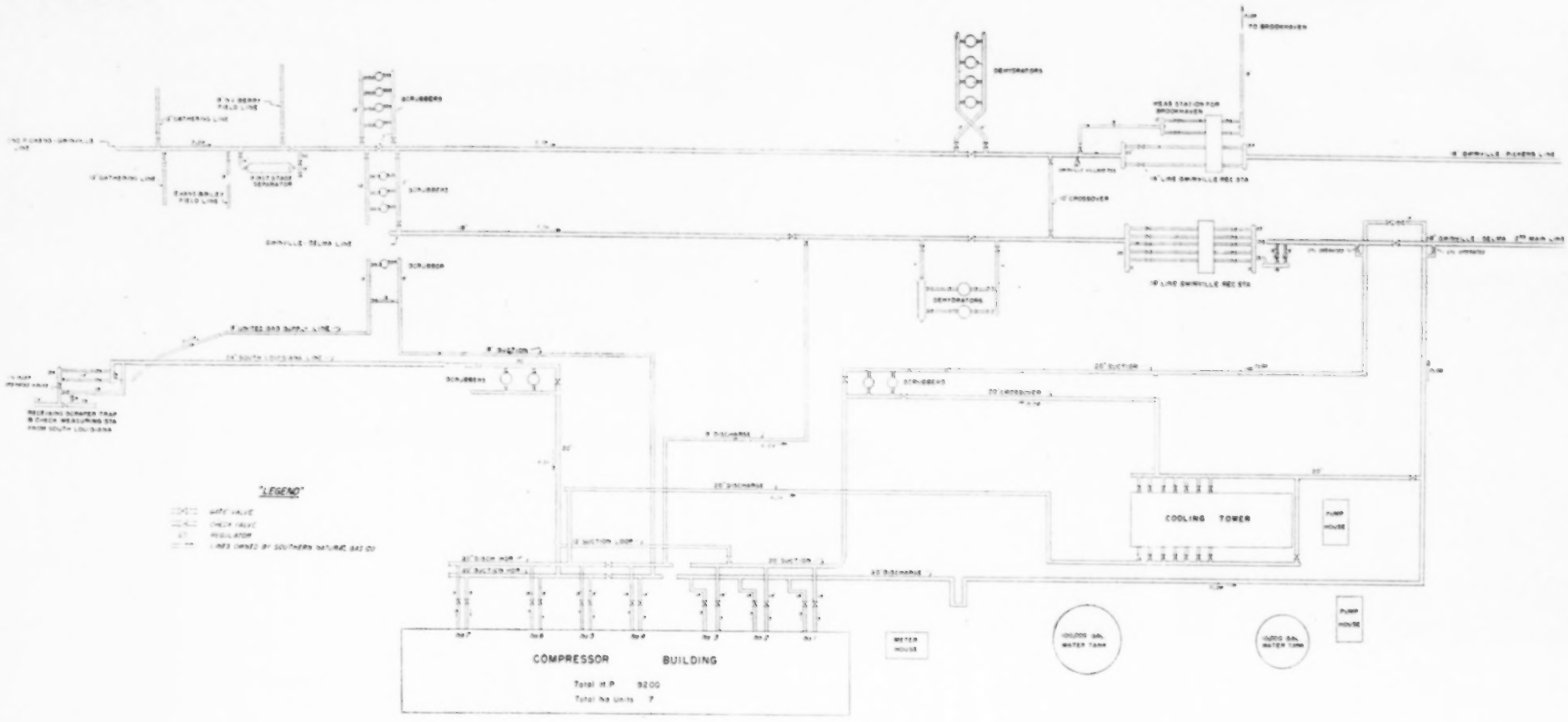
Dept. 407 210 West 10th St., Kansas City 5, Mo.

CHICAGO · HOUSTON · NEW ORLEANS · NEW YORK
PITTSBURGH · ST. LOUIS · TULSA

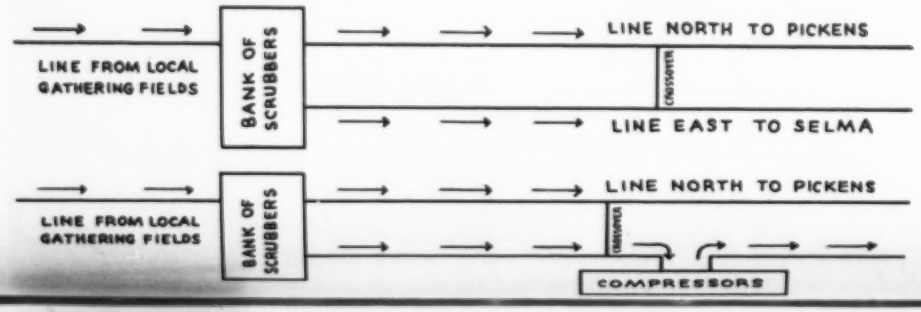
SERVING THE GAS, POWER, PETROLEUM AND CHEMICAL INDUSTRIES

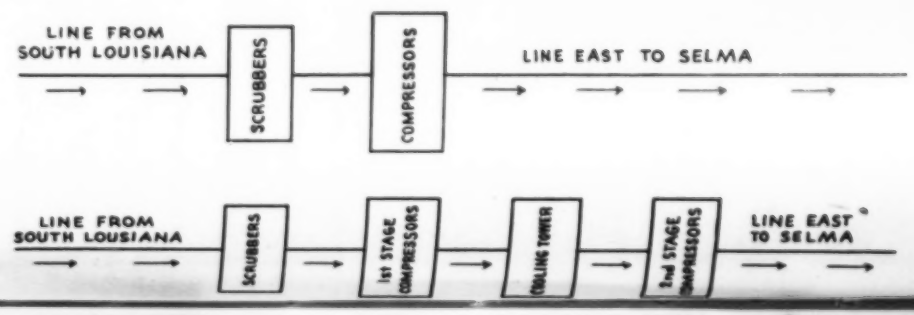
Dehydration Plants

Gwinville compressor station



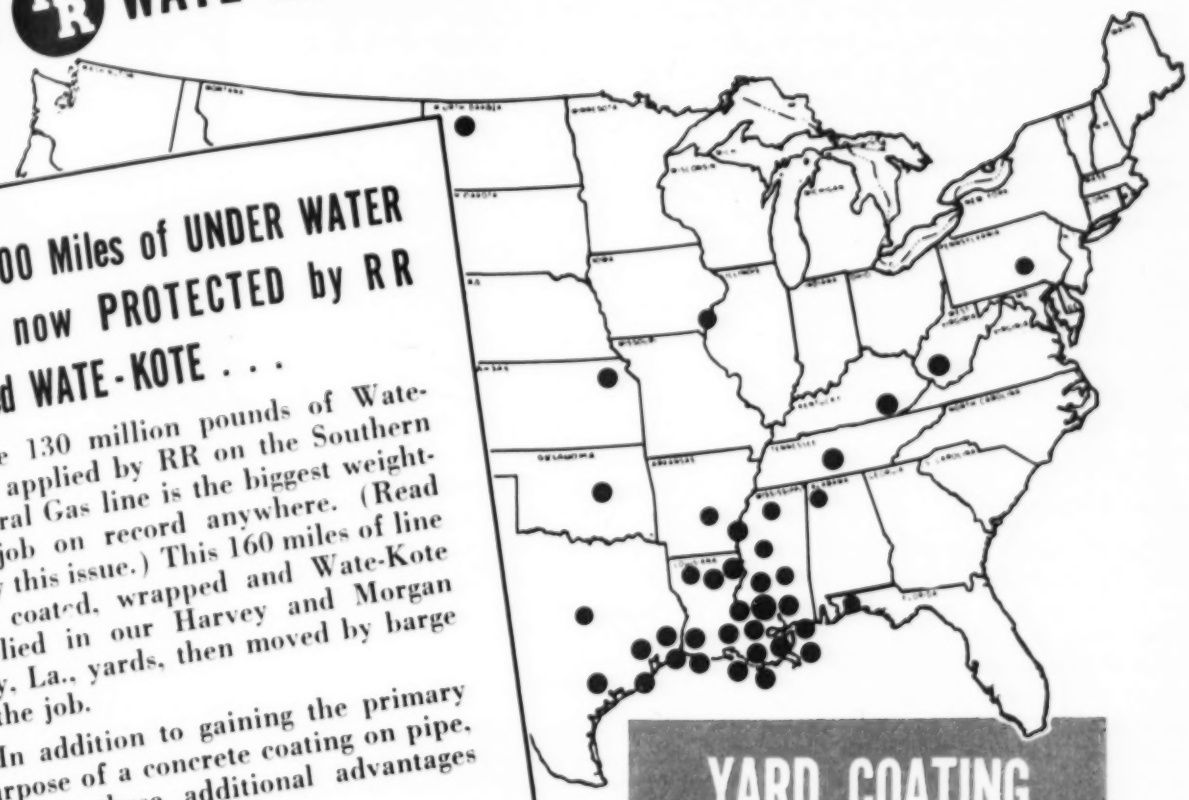
A high degree of flexibility is built into Gwinville station, a key point on the Southern Natural system. Gas from local fields and from south Louisiana may be sent through the system in a number of ways and combination of ways, and at several selected pressures. (For further reference to the station layout, turn to page 132.)





160 Miles...

of RR WATE-KOTED PIPE for SOUTHERN NATURAL



Over 600 Miles of UNDER WATER Lines now PROTECTED by RR Applied WATE-KOTE . . .

• The 130 million pounds of Wate-Kote applied by RR on the Southern Natural Gas line is the biggest weighting job on record anywhere. (Read story this issue.) This 160 miles of line was coated, wrapped and Wate-Kote applied in our Harvey and Morgan City, La., yards, then moved by barge to the job.

In addition to gaining the primary purpose of a concrete coating on pipe, you get these additional advantages with Wate-Kote:

1. Protection for enamel coating from rough handling of pipe.
2. Protection for enamel coating from barnacles and other marine organisms.
3. Distribution of weight over entire length of pipe.
4. Almost always costs less per foot of installed pipe than any other type of weighting material.

YARD COATING and WRAPPING

WATE-KOTE CONCRETE RIVER WEIGHTS

• *Write today for folder telling method of applying Wate-Kote, pipe displacement and weights, buoyancy of pipeline submerged in fluid backfill, etc.*

RR ROSSON-RICHARDS

1076 M&M BUILDING • Phone CHarter 4661 • HOUSTON 2, TEXAS

CORPUS CHRISTI, TEXAS	JACKSON, MISS.	HARVEY, LA.	CHARLOTTE, N. C.
P. O. Box 908	P. O. Box 1227	P. O. Box 33	P. O. Box 2053
Phone 4-2428	Phone 5-2403	Phone EDison 1663	Phone 5-3909

Part 3. South Louisiana construction ran the gamut of pipelining problems

THE extension of the Southern Natural Gas Co. gas supply system into the marshes and swamps of the south Louisiana bayou country and offshore into the open Gulf to tap the gas rich fields in the Mississippi delta has resulted in one of the most difficult and most expensive pipeline projects ever undertaken by any transmission company. Of the nearly 400 miles of pipeline laid in this phase of the program, about half, or almost 200 miles, was laid by marine methods. This construction, including compressor facilities, accounted for about half of the $76 million project that makes up the major part of the company's current expansion program.

Runs the gamut

Construction of the south Louisiana supply route from Gwinville compressor station in south central Mississippi through east and west legs to gathering fields in the lower delta presented practically the entire gamut of pipelining problems. Starting out on comparatively dry land in Mississippi, the line, after it divides at Franklinton, takes two nearly straight courses through almost impassable regions of the delta to depths of over 20 ft in the Gulf proper. In addition to the problems of devising a suitable barge-loaded pipeline spread for marsh and swamp laying, unusual techniques and equipment were required for the nine-mile crossing of Lake Pontchartrain and for two multiple crossings of the Mississippi river. Still other problems confronted in the construction of measuring and receiving stations on man-made islands and platforms, and in the corrosion protection of many miles of line in brackish and salty water. Marine laying methods were required on about 50 miles of the west leg, that part of the line south of the north bank of the Mississippi river, and on nearly 150 miles of the east leg, that part south of the north shore of Lake Pontchartrain. Major part of this line is 20 in. with some gathering laterals as small as 4 in.

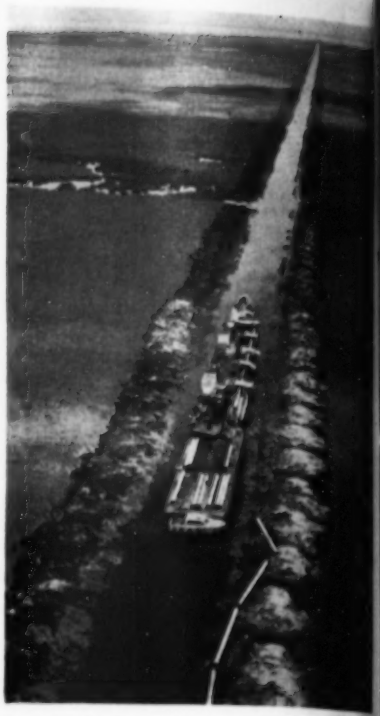
Charting route

Charting the pipeline route required many months of labor before actual construction could get under way. High wheeled marsh buggies, often the only possible means of transportation in the bayou country, together with helicopters, were put to use by survey parties.

The so-called south Louisiana system is made up of a 24-in. line from Gwinville compressor station and two 20-in. legs which split off at Franklinton, about 68 miles south. The west leg of the system crosses the Mississippi in four 12-in. lines at Carville, La., location of the famous Carville leprosarium, and extends another 30 miles to Duck Lake field. Beyond Duck Lake a 12-in. line extends another 20 miles to Lake Sand field on the Gulf proper. The latter two lines were laid in heavily wooded swamp lands.

East leg

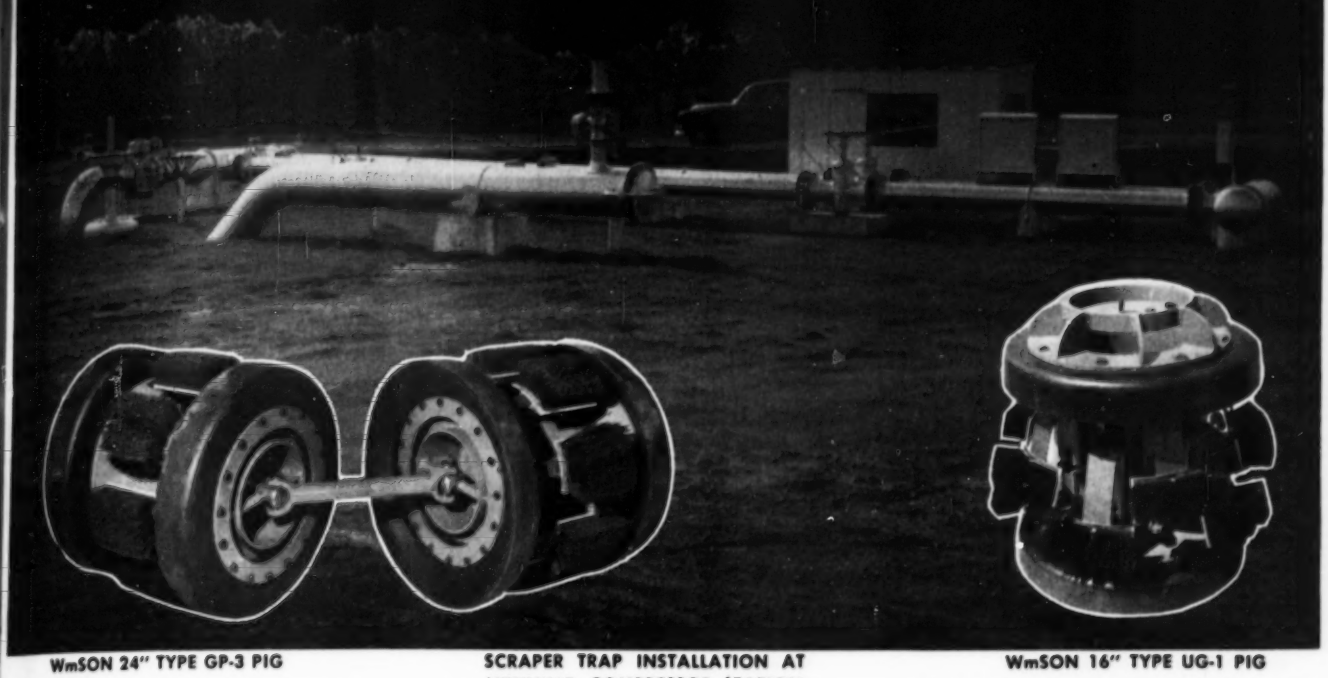
The 20-in. east leg extends some 130 miles south of Franklinton to a network of over 60 miles of gathering laterals in the lower delta region. One of these laterals reaches nearly five miles into Lake Pontchartrain to receive gas from Big Point field. Another extends from immediately south of Toca compressor station, also located on the east leg, across the Mississippi river to West and South Barataria, Bayou De Fluer and Alliance fields. The main portion of the



Overhead view of a lay barge operating in a canal on the east leg of Southern Natural's south Louisiana system. Covered positions along the right side of the barge are where the line is assembled, welded, tested, and field joints cemented.

Southern barge terminal dock during loading of 42,000 tons of 20-in. Smithway line pipe for Southern Natural.

a salute to
SOUTHERN NATURAL GAS CO.



WmSON 24" TYPE GP-3 PIG

SCRAPER TRAP INSTALLATION AT WINVILLE COMPRESSOR STATION

WmSON 16" TYPE UG-1 PIG

Wm-SON-HILLCO TAPPING MACHINE

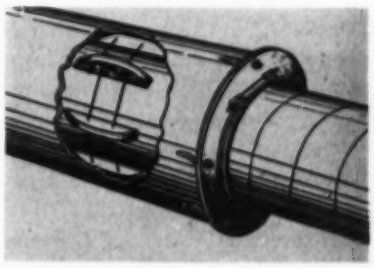
For making lateral connections to the pipeline . . . without shutdown . . . against line pressures up to 1,200 psi.

A Feature of Southern Natural's New Pipe-Line System is Provision for ON-STREAM PIGGING . . . to maintain maximum capacity without shutdown or loss of gas.

Williamson is proud to have provided — and serviced with factory-trained engineers — WmSON Pigs, Tapping Machine, Bushings and Insulators to meet Southern Natural's exacting requirements.

WmSON 18" LBN-4 PIG

For initial filling with liquid . . . to displace air from overbends . . . Also to separate dissimilar fluids.



WmSEAL CASING BUSHINGS AND CONCENTRIC-SUPPORT INSULATORS . . .

For use where pipelines pass through right-of-way casings.

T. D. Williamson, Inc.

THE PIG WITH THE POKE
CLEANS PIPE LINES

P. O. BOX 4038
TULSA 9, OKLAHOMA

REPRESENTATIVES . . . HOUSTON • PITTSBURGH • KENILWORTH, N. J. • AMARILLO • CASPER, WYO. • PROVO, UTAH
LOS ANGELES • OAKLAND • EDMONTON • CALGARY • TORONTO • BUENOS AIRES • DURBAN, NATAL, SOUTH AFRICA

Mississippi river crossing at Carville on the west leg of the south Louisiana system. Position of the barges in the center of the river indicates the sharp curved fashion in which the pipe was laid in the bottom of the river, a technique which has been applied by General Timothy in making river crossings.

line south of Toca, however, parallels the east bank of the Mississippi to several fields in the tip of the delta. Two of these, the Main Pass field and the Breton Island field, are located offshore in Gulf waters.

Some 220 miles of line pipe used in this phase of the construction program made up the largest single barge shipment ever to leave Houston's bustling harbor. The 42,000-ton shipment of pipe was out of the A. O. Smith plant in Houston. The pipe was shipped on barges directly to coating yards in Harvey and Morgan City, La.

Most of the south Louisiana line was laid in 40-ft wide by 6-ft deep canals dredged through marsh and swamp land. Specially designed barges laid the line in 2-ft deep trenches cut in the bottom of the canal 10 ft in from one side. Each of four Brown & Root lay barges used in this operation was actually a floating pipeline spread complete with supply shack, radio room, and welding and radiographic facilities.

Navy LST used

A converted Navy LST was used for laying the line to the Breton Island and Main Pass fields in the open waters of the Gulf of Mexico. Laying technique was practically the same as that used in the marsh and swamp areas except that provisions were made to lower the line from the barge at a steeper angle. In the deeper water dredging was not required and the lines were laid directly on the bottom and later buried to a depth of about 3 ft by jetting process.

Most of the construction required three completely separate operations. Natives of the delta area equipped with axes were first used to cut a swath through the trees and underbrush. Following the natives came dredges which cut the 40-ft wide canals. In a third operation the dredges returned to cut the actual pipeline trench in the bottom of the canal.

Hinged barges

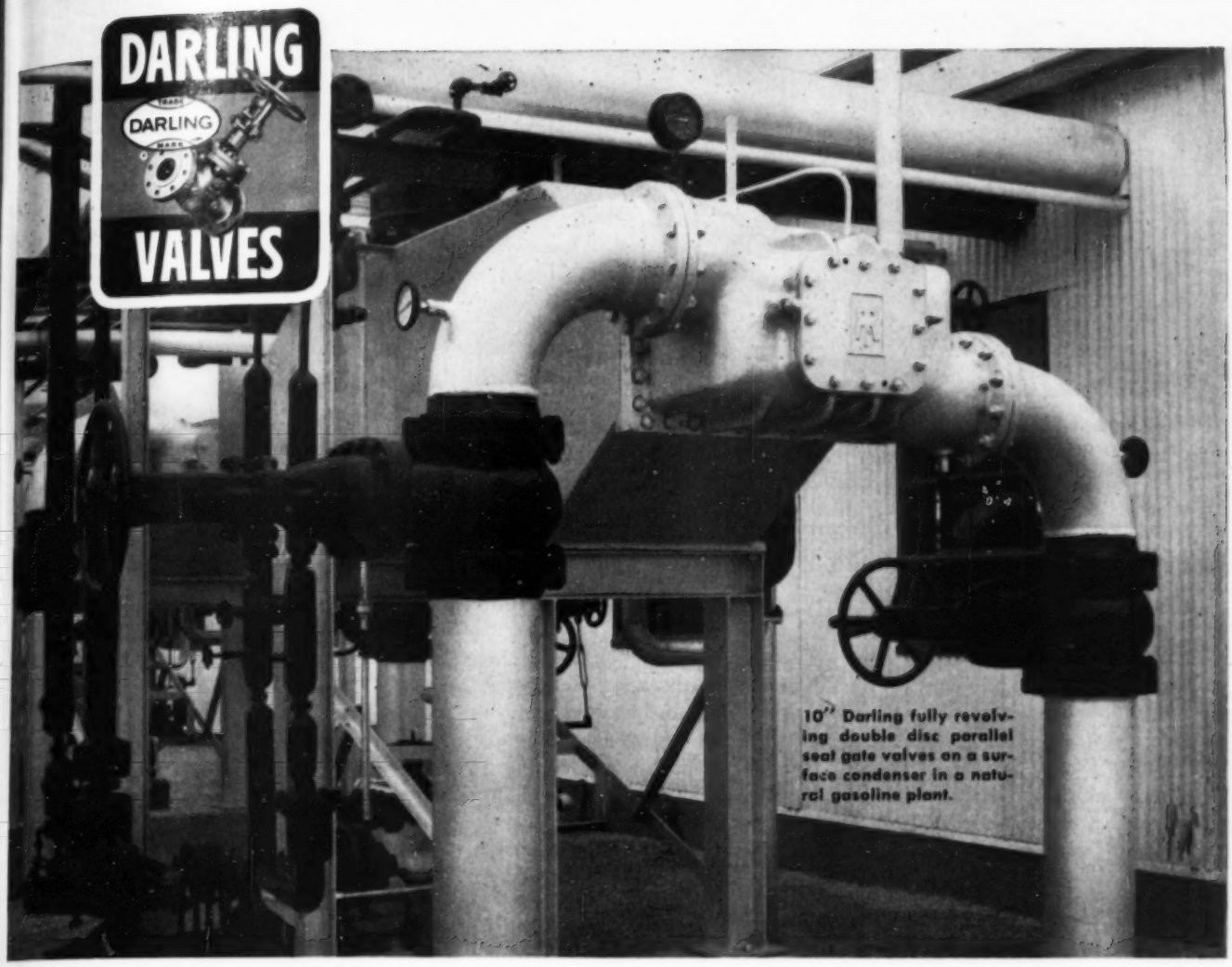
Each of the lay barges actually consisted of two 110-ft by 30-ft barges hinged together. A 120-ft by 30-ft pipe barge was tied on to the front of the "spread" and unloaded on to the laying barge as progress continued. Forty-foot sections of pipe were assembled into the line at a series of work stations along one side of the barge. The operation started as a section of pipe was removed from the pipe barge and lined up at the first work station. After the stringer bead weld had been applied the line moved on tiltable shoes equipped with vertical and horizontal rollers to the next work station where finish welds were applied. Continuing to the third station, the weld was primed and X-rayed, and at the fourth station the field joint was wrapped and doped. At the final work position the field joint was cement coated and lowered into the water. The line was not backfilled because the unstable nature of the canal bottom in this area made such an operation unnecessary.

Compartments flooded

Some compartments in the rear of the laying barge were flooded to bring the end of the deck to water level. The actual lowering operation was done with an A frame attached to the rear of the barge. This was a particularly critical operation because if the cement coating was allowed to crack water would seep in to the surface of the pipe and cause excessive corrosion. The Herman B, a converted Navy landing craft, was used in laying about 14 miles of the offshore line to Breton Island and about two miles of the offshore line to Main Pass.

Somewhat different pipeline laying techniques were required in making the

Natives of the south Louisiana bayou country standing in piroques cutting timber on the right-of-way in Atchafaloya basin on the west leg of the south Louisiana gathering systems.



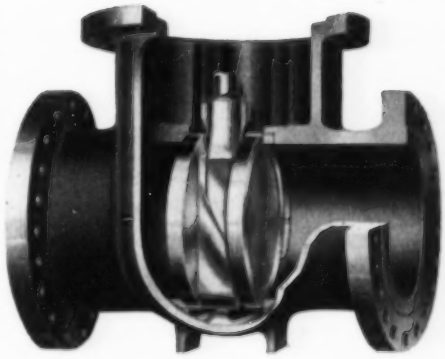
10" Darling fully revolving double disc parallel seat gate valves on a surface condenser in a natural gasoline plant.

How they save dollars in natural gasoline service with DARLING Revolving Disc GATE VALVES

TIGHT CLOSURE EVERY TIME!...That's one big advantage of Darling revolving disc gate valves on this surface condenser. The fully revolving double disc parallel seat feature of these Darling valves automatically compensates for valve body distortion, *assuring tight closure* and *uniform* distribution of disc and seat wear too... even under severe pressure and temperature changes.

JUST FOUR SIMPLE WORKING PARTS. ...Two interchangeable, no-pocket discs and two husky wedges are all the operating parts in Darling *fully revolving double disc* parallel seat gate valves. No links or other devices are needed to hold the discs and wedges together. Any part can be quickly and inexpensively replaced without removing the valve from the line.

WIDE RANGE OF SIZES. Darling revolving disc parallel seat gate valves come in types and sizes for main line, gathering, manifold, tank farm and other gas and oil line services. Just outline your specific service requirements or write for descriptive literature today!

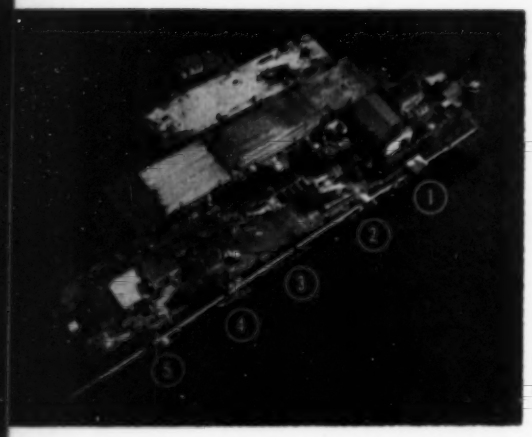


Cutaway showing complete simplicity of the Darling fully revolving double disc parallel seat principle.

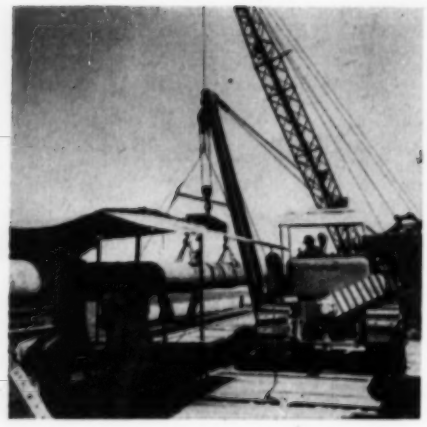
DARLING VALVE & MANUFACTURING CO.

Williamsport 26, Pa.

Manufactured in Canada by Sandilands Valve Manufacturing Co., Ltd., Galt 19. Ontario



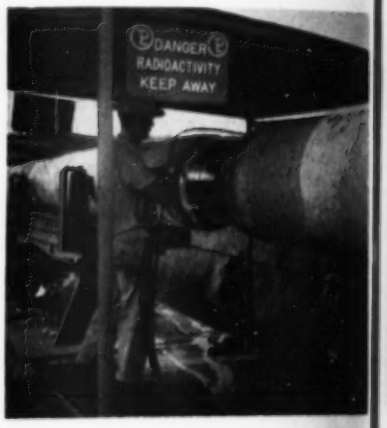
Overhead view of lay barge showing operational sequence aboard. Alongside of it are the pipeline barg eand the sand barge.



The pipe is moved into position before the operations pictured at right begin.

1. Close-up of the pipe line-up operation aboard the laying barge.

2. Finish weld being made between two lengths of pipe.



3. X-ray position where the field weld is X-rayed.

two multiple river crossings. Four 12-in. lines were laid across the Mississippi river at Carville in 13 days and two were laid across the river at Star Point on the West Barataria line in nine days. In addition there were some 150 waterway crossings of various depths.

The line was laid in the flotation canals to a minimum depth of 6 ft below mean sea level. Because tides increased this depth at times to 12 ft, it was necessary to provide an adjustable lowering arrangement on the lay barge that would accommodate depths of from 8 to 12 ft. With the two barges that made up the spread horizontally hinged together and the rear barge partially flooded in its rear sections to bring its deck to the water line, it was possible to allow the line to take a curved path across the five work positions and into the water. On the converted landing craft lay barge, used in deep-water laying, the line took a straight path across the five work positions.

Line sagged or bent

In crossing intersecting waterways the line was sagged or mechanically bent, depending upon the depth required. On the deeper crossings the pre-bent line was welded and weighted with heavy river clamps before it was lowered into the water with a battery of cranes.

In making the two Mississippi river crossings, instead of following the conventional straight line or single curve method, the lines were laid in a series of opposing curves. This technique* was worked out by Gen. P. H. Timothy, engineer in charge of the project, and originally used on a Southern Natural crossing near Vicksburg, Miss. The method is designed to allow for enough slack pipe that the line can adjust itself to the constantly changing river bottom. Triple-jointed lengths of pipe were welded together and fitted with 1230-lb cast iron river clamps before they were lowered into the river.

Corrosion protection

A fundamental consideration throughout the laying operation in the south Louisiana system was provision for adequate corrosion protection. Of particular importance were those lines laid in the brackish and salty waters of the lower delta and the open Gulf. This portion of the project received as

4. Field joint being wrapped and doped with hot tar. (Lower right.)

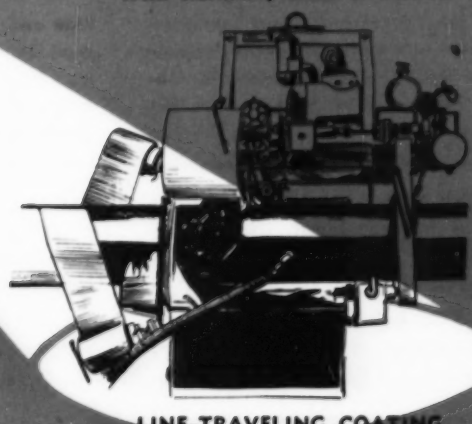
5. Molded cement coating being put on the field joint. Sheetmetal is used for the mold and is left on the pipe when it is dropped into the water.

*General Timothy's work in developing river crossing techniques was explained in an article entitled "River Crossing Failures," which appeared in the May 1952 issue of *GAS*.

REMCO

LINE-TRAVELING CLEANING AND PRIMING MACHINE
3" thru 36"
With stationary bases if desired

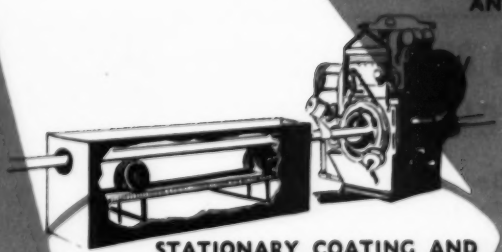
IN THE SPOTLIGHT!



LINE-TRAVELING COATING AND WRAPPING MACHINE
2" thru 36"

COLD COATING AND WRAPPING MACHINE
Any size pipe

"KOLD KOATER"
The only machine using the extrusion method of applying cold dopes.



STATIONARY COATING AND ROTARY-HEAD WRAPPING MACHINE
¾" thru 8" ⅛" thru 12"
2" thru 34"

JUST ASK FOR "BO" - 85-1504

ANYTHING
ANYTIME
ANYPLACE

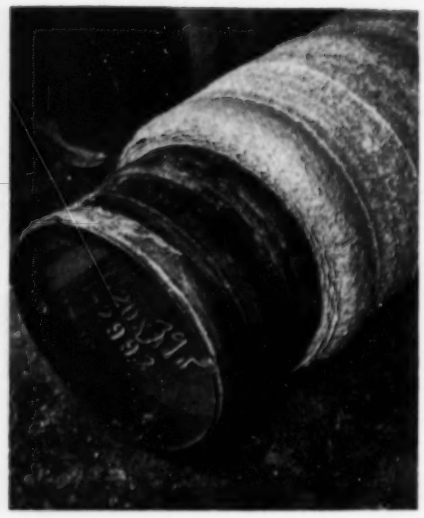
REMCO PIPELINE EQUIPMENT & SUPPLIES

TULSA P. O. BOX 3005

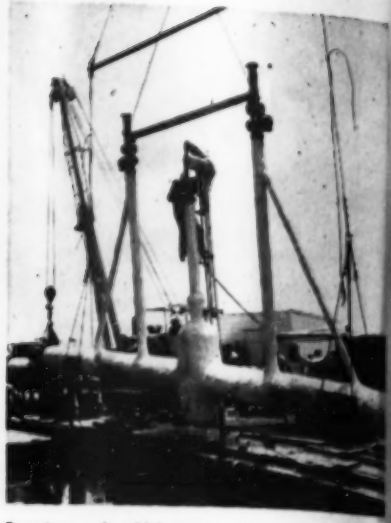
PH. 85-1504

NITE PH. 9-7570 • 6-1343

Close-up of concrete coating operation showing concrete being thrown on as pipe is rotated through coating machine. Reinforcing mesh can be seen as it comes down from above.



One end of wrapped and concrete-coated pipe showing wire mesh in center of coating. Pipe was wrapped to within 9 in. of end and concrete coated to within 14 in. of the end.



Section of offshore underwater line including a valve that was completely coated by Brown & Root in one of Rosson-Richards' yards. It is shown aboard a lay barge being readied for lowering.

much if not more time in the planning stage than any other part of the construction job. The planning was done by Southern Natural's engineering forces and the field engineering during construction was performed by the firm of Ford, Bacon and Davis Construction Corp. Cathodic protection of the line was engineered by Cathodic Protection Service of Houston and New Orleans.

By calling in cathodic protection engineers during the planning stages of the project it was possible to integrate the protection program with construction and thus afford a saving in time and money. For example, by coordinating line protection with construction it was possible to secure easements for ground beds and stake them out along with the pipeline right-of-way. The practice also made it possible for cor-

A YOUNG UNDER-ROAD BORING MACHINE WILL BORE IT OR IT CAN'T BE BORED!

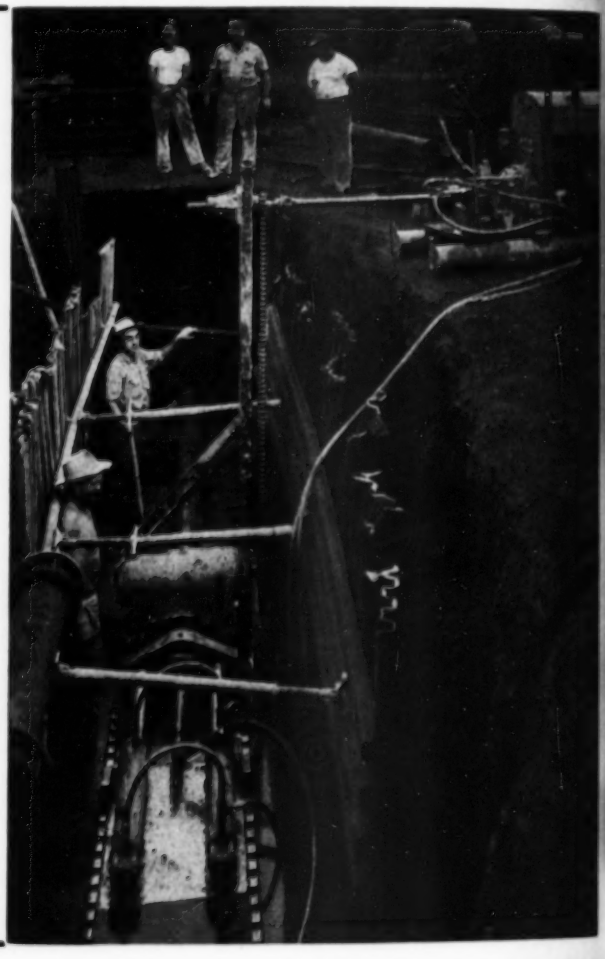
The Young Under-Road Boring Machine saves pipeliners time and money by speeding the installation of casings 6" to 30" under highways and railways and through embankments.
Tough soil formations are no problem for the Young Boring Machine—it regularly bores through sand, gravel, slate, rock formations and even heavy timbers and concrete walls where other type machines have failed. Here are some outstanding examples of this machine's performance:

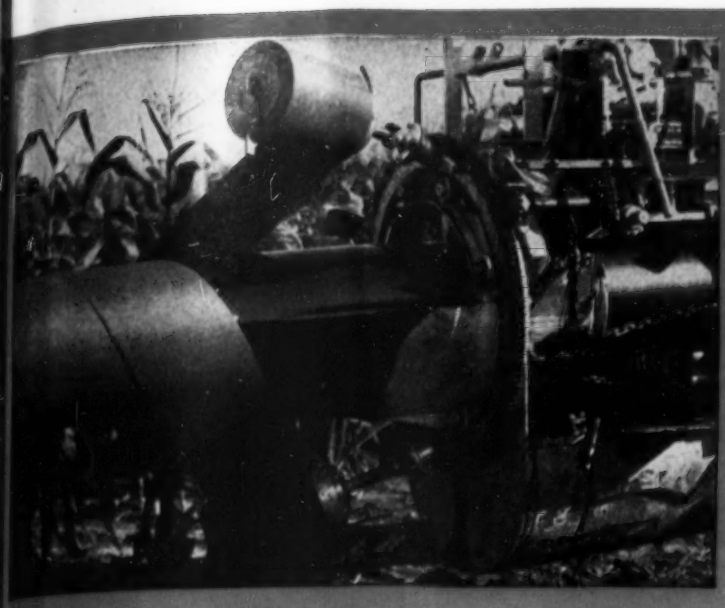
85 ft. of 20" casing through solid slate
250 ft. of 30" casing through wet, swampy soil
115 ft. of 24" casing through solid silica rock
425 ft. of 10" casing through sand and clay

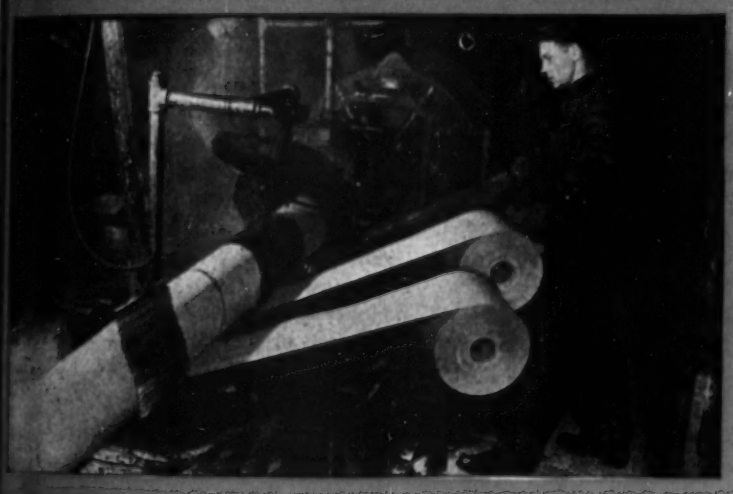
Additional lengths of casing are installed as boring progresses, preventing settling of road bed. Cuttings are flushed from casing with water. The casing with hard steel cutterhead serves as "drill pipe" and bores extremely accurately. Only the cutterhead and drive ring need changing for different size casing.

PROMPT DELIVERY
Rental Machines Also Available
Write for Bulletin 15-G5

THE YOUNG ENGINE CORPORATION
CANTON, OHIO







by Traveliner

On long lines, traveling machine application of NO-OX-ID and NO-OX-IDized Wrappers produces greater footage with smaller coating crews. NO-OX-IDs do not produce noxious or harmful fumes.

by Hand

Over rough terrain—on short lines—on maintenance jobs, Dearborn NO-OX-ID and NO-OX-IDized Wrappers are easily applied either cold or hot. A NO-OX-ID coating of only 1/32" is adequate for long term protection.

at the Mill

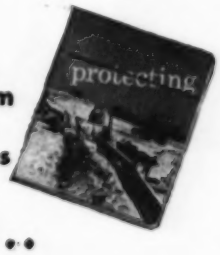
Independent applicators and many utilities rely on NO-OX-ID combinations applied by stationary coating machines for *complete* pipe line protection.

know your Dearborn Engineer

Dearborn has specialized in the control of corrosion and the conditioning of water since 1887. This broad experience—plus Dearborn's extensive research and laboratory facilities—are at your service...at no obligation. You'll find it will pay to know your Dearborn engineer.

FOR YOUR FILES...

This informative Dearborn book "Protecting Underground Pipe from Corrosion with NO-OX-ID and NO-OX-IDized Wrappers." Illustrates and describes all methods



YOUR COPY IS READY... UPON REQUEST

General view of one of two Rosson-Richards yards that wrapped and concrete coated all the line for water laying in south Louisiana. Two complete concrete coating machines are shown.

rosion engineers to make certain that nothing done during construction would complicate the protection project. The proper coating for the type of soil in which the line was to be laid was specified and applied, casings were insulated and sealed, and test leads and current drain leads were installed at the proper locations all as an integral part of the construction. A more economical protection program resulted, also, because it was possible to prefabricate anode strings to be installed by the pipeline contractor.

Dual purpose

The concrete coating that was used on the line served the dual purpose of providing weight to keep the line on the bottom and protection to the enamel and wrap. The line was wrapped and coated in 40-ft lengths at the Harvey and Morgan City, La., yards of Rosson-Richards Co. The pipe was first cleaned and primed and then allowed to dry, after which a 3/32-in. coating of Barrett intermediate grade mill wrap enamel was applied. Following this came a .015-in. thick Coromat Type 20 Fibreglas wrap and then a second coating of enamel. Following the second enamel coating the pipe was wrapped with 12-lb Kermac Fibreglas outerwrap. The latter is an asphaltic-saturated glass wrap. The wrap was then tested with a holiday detector and placed on cooling boards to dry.

Over the coated and wrapped pipe, 1 to 2½ in. of high density reinforced concrete was applied by Rosson-Richards "Wate-Kote" process.

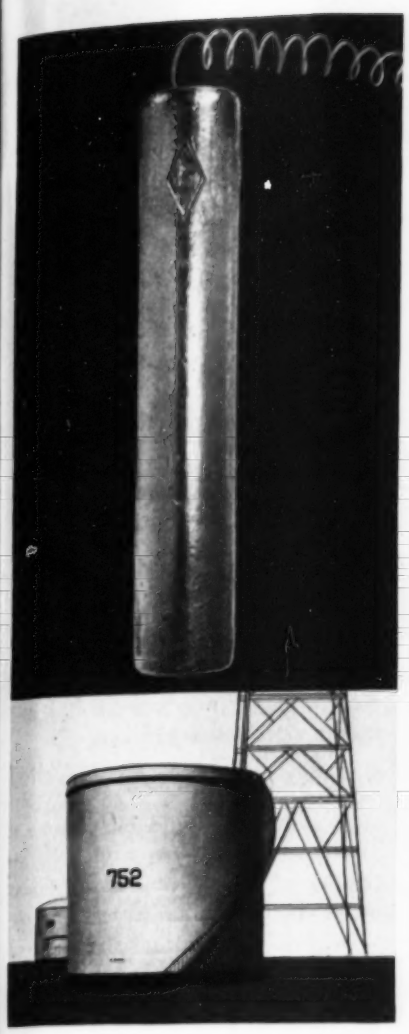
This applied the concrete by high velocity impact at a rate of 1600 lb per minute simultaneously with the 1-in. x 18 gauge Keymesh reinforcing to within 14 in. of each end of each joint. The bulk density of the concrete was varied from 140 pcf to 190 pcf to provide the required negative buoyancy for the different pipe sizes and laying conditions.

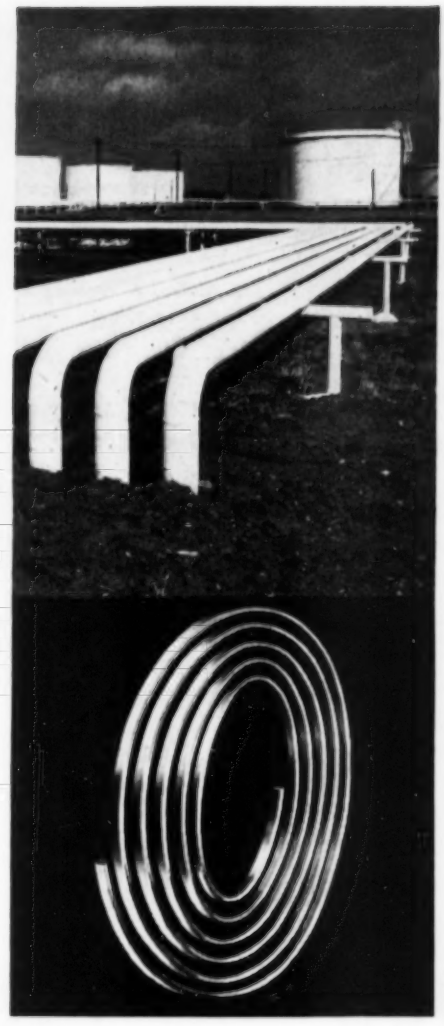
Three applicators

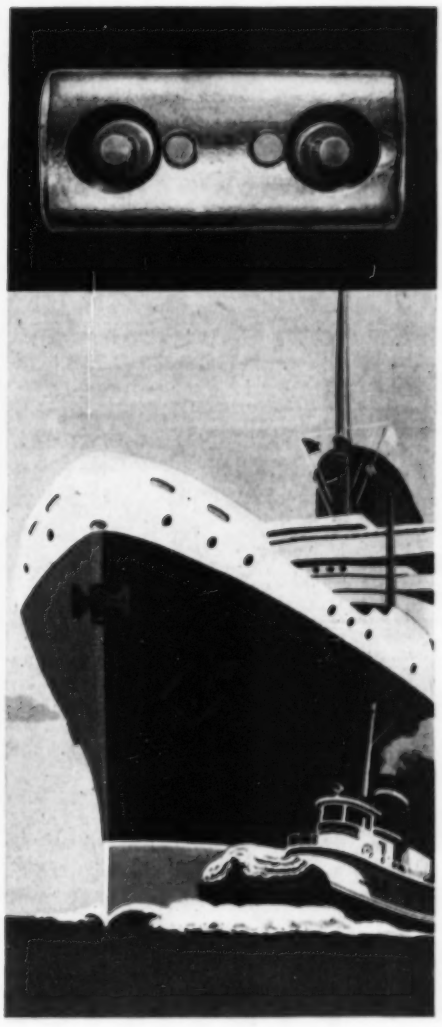
Two Wate-Kote applicators were used at Harvey for six months and one at Morgan City for three months, each applying up to 500,000 lb per day, to complete the 130-million-lb project on schedule.

In an effort to establish the correct amount of weight for the underwater lines without the excessive use of concrete coating, samples were taken of soil along the pipeline route. Specific gravities were such that it was felt necessary to apply sufficient concrete in order to give the pipe a specific gravity varying from 1.25 to 1.45. A specific gravity of above 2.0, however, was required in the river crossings which was attained by the use of cast iron river weights. To gain weight without exceeding a practical coating thickness, a heavy barite aggregate was used on the larger diameter pipe. The percentages of barite varied from zero on the smaller diameter lines to 100 on the Lake Pontchartrain line. On the latter 20-in. line, which had a wall thickness of 11/32 in., the dry weight of a 40-ft length of pipe was 11,943 lb. A pipe of the same diameter and wall thickness with 50% barite weighed 10,76

DOW







YOU CAN'T BEAT DOW MAGNESIUM ANODES FOR DEPENDABLE CORROSION CONTROL

Forget about cathodic protection repair bills—install high purity cast anodes and labor-saving ribbon anodes

Once installed, Dow magnesium anodes will never let you down. Throughout their entire life span they never stop providing *dependable*, low-cost corrosion control.

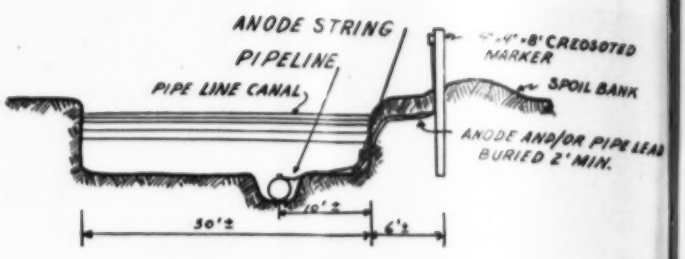
When you standardize on magnesium anodes you can forget about power failures and costly repair bills caused by storms, rodent attack on power leads, and dried-out ground beds. Magnesium anodes provide their own current for continuous cathodic protection.

And now the cost of cathodic protection is sharply reduced, thanks to the new *high purity* of Dow cast anodes. These new anodes last far longer and give you more ampere hours of protection.

Whether underground or marine; whether you require only "hot spot" protection or over-all coverage, you will find there's a Dow magnesium anode designed to solve your particular corrosion problem. For the complete story write THE DOW CHEMICAL COMPANY, Midland, Mich., MA 312L.

DISTRIBUTORS: ANTI-CORROSION MFG. CO., Atlanta, Georgia • CATHODIC PROTECTION SERVICE, Houston, Texas • ELECTRO-RUSTPROOFING CORP., Belleville, N. J. • ROYSTON LABORATORIES, INC., Blawnox, Penna. • STUART STEEL PROTECTION CORP., Kenilworth, N. J. • THE VANODE CO., Pasadena, California.

you can depend on DOW MAGNESIUM ANODES DOW



Above: A drawing of a typical test lead or anode station in a flotation canal.

Left: Map showing location of rectifiers and graphite ground bends and magnesium anodes.

lb per 40-ft length. The bare pipe in both instances weighed 2886 lb.

Field joints

Field joints, including a concrete coating, were made aboard the lay barge. The welded joints were coated by hand and wrapped with Glasfab. A sheet metal mold that overlapped the cement coating on the individual pipe sections was used as a sort of trough and filled with cement to form the joint coating. The metal mold was banded around the pipe and remained in place as the pipe was lowered into the water.

Both graphite ground beds and sacrificial anodes were used for pipe protection. Ground beds and rectifiers were used where power was available and anodes at all other locations.

Graphite ground bed

A graphite ground bed located at Toca compressor station protects the east leg of the south Louisiana line as far as about 30 miles south of the sta-

Proficiency in Pipelining

With the combined experience in pipeline construction totaling many centuries, and spanning many sections of America, Houston Contracting Co. performance meets the highest standards of proficiency.

HOUSTON CONTRACTING COMPANY LTD.

General Partners:
Laurence H. Favrot
R. P. Gregory
Associate:
Geo. A. Peterkin

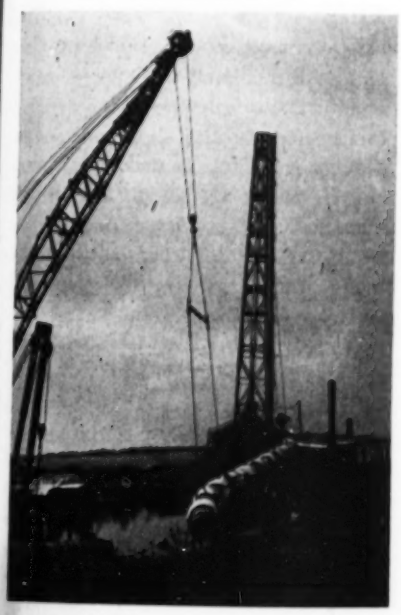
General Contractors

Oil - Gas - Gasoline - Water Pipe Lines
2707 FERNDALE HOUSTON 6, TEXAS

tion. From this point to the southern tip of the line, including laterals, a total of 100 100-lb magnesium anodes was installed. Cathodic Protection Service, in designing protection for the line, prefabricated anode strings made up of four 100-lb anodes placed together end on end. Space between the anodes was grouted with concrete and electrical connection was made with ¾-in. steel rod through the center of all four. Two clusters of three anode strings each, totalling 1200 lb of magnesium, were used on the offshore Breton Island line, and one cluster of three anode strings was used on the Main Pass line. Two anode strings and single four anode units were used at other locations.

Anode strings

For the protection of pipe in flotation canals, prefabricated anode strings totalling 400 lb each were laid by the barge loaded pipeline spreads. The pipeline contractors lowered anodes into the canal at locations indicated by corrosion engineers. The strings were laid on the bottom between the pipeline and the side of the canal. The lead wire from the anode and the connection wire to the pipeline were brought out and fastened to a post on the bank of the canal. Protection engineers later made the connection between the two wires by taking a current reading and inserting the required resistance. Sacri-



Pipe fitted with concrete clamps being lowered into place at the beginning of the Intercoastal Waterway crossing near New Orleans on the east leg of the south Louisiana system.

HAMER *Visible Shut-off*
LINE BLIND VALVES

HAMER PLUG VALVES

Will not stick or freeze. Perfect for hard-to-hold fluids. Simple plug adjustment nut eliminates sticking

Hamer Line Blinds are unsurpassed for positive action, easy operation, long-life service and lasting safety. One man can open or blind a line in less than one minute, and there is nothing like a solid plate for a **permanent leakproof shut-off.** Bar or handwheel operation eliminates wedges, hammers, wrenches needed for spreading conventional flanges. Removes fire hazard of sparking and stops damage to equipment.

Write for FREE catalog

HAMER VALVES, INC.
2919 Gardenia Avenue
Long Beach 6, California
Representatives throughout to United States

SERVICED BY THE MEN WHO SELL IT

Another reason why You can depend on

TAPECOAT®

the Coal Tar Protection in Handy Tape Form

The service behind TAPECOAT is as distinctive as this coal tar coating, itself.

To make this service as dependable as the product, the sales engineer who sells the job also services it. This means that you can count on everything he tells you because he is responsible for the job *personally.*

The fact is, TAPECOAT gives you more lasting protection for your money because it is a quality coal tar product, and coal tar is nature's own defense against corrosion.

Specify TAPECOAT for pipe, pipe joints, tanks, and other vulnerable steel surfaces above or below ground. Its performance record since 1941 merits your complete confidence.

TAPECOAT comes in rolls of 2", 3", 4", 6", 18" and 24" widths. It's easy to apply as our sales engineers will demonstrate.

Write for brochure and prices today.

The* TAPECOAT *Company

Originators of Coal Tar Tape Protection

1535 Lyons Street, Evanston, Illinois

An H. C. Price pipeline spread laying a 24-in. loop line from the north transmission system near Birmingham, as part of the current expansion program.

ficial anodes on the south Louisiana lines were designed for a 15-year life.

There are no pilings or above-water structures at anode locations on the offshore lines. However, at about midway between each of the anodes there is a test lead brought out from the line and fixed to a marking piling.

Immediate polarization

Because of the salty and brackish waters in which the south Louisiana line was laid, polarization took place almost immediately after the anode was installed. Equilibrium was, therefore, established within a short time and engineers were able to make the connection between the anode and the line without delay. The same conditions did not exist on the ground bed installations, however, where it was necessary to compute the current requirement and then make a later adjustment after backfill had consolidated sufficiently.

Four graphite ground beds were installed on the west leg of the line and three, including Toca, installed on the east leg. An additional ground bed was installed at Franklinton and another south of Gwinville. The beds are made up of 3-in. x 60-in. blanks that are fitted with driven copper connectors.

Three additional groups of anodes are used on the Lake Pontchartrain line to protect three 4-in. and three 2-in. gathering lines in the lake.

Another Year of
Pipeline Progress

Over 560 miles of "Big Inch" construction completed on schedule in 1953 by H. C. Price Co.

70 miles

TENNESSEE GAS TRANSMISSION

43 miles

TEXAS GAS TRANSMISSION

185 miles

SOUTHERN NATURAL GAS COMPANY

266 miles

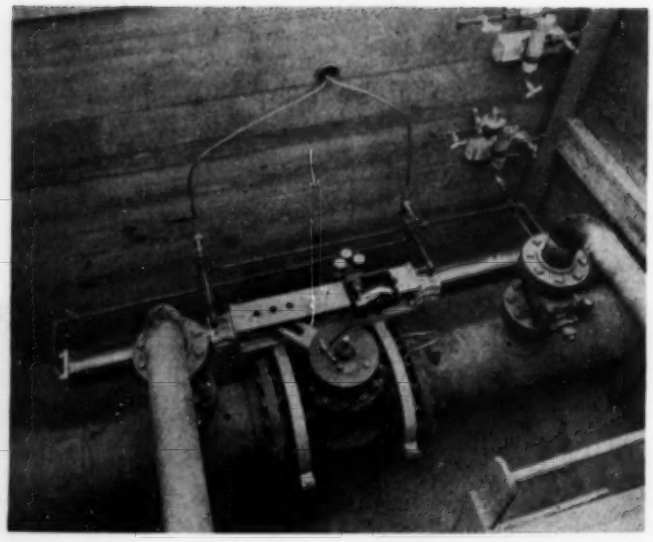
GULF INTERSTATE GAS COMPANY

Total 564 miles

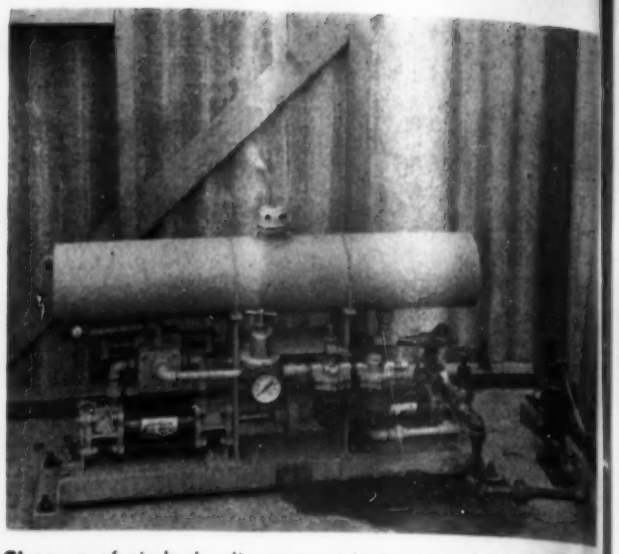
PIPELINE
H. C. **PRICE** CO
CONSTRUCTORS

BARTLESVILLE, OKLAHOMA

America's Foremost Pipeline Constructors



Close-up of valve actuator mounted on 24-in. pulg valve; positioner mounted over actuator.



Close-up of air-hydraulic pump, prime mover of valve actuator.

Tandem-type actuator widens applications of automatic and remote valve control

By **ALEXANDER A. TOBEN, Manager, Hydraulic Department**
Ledeen Manufacturing Co., Los Angeles

A NEW type valve actuator that makes use of two cylinders coupled together in tandem to operate the stem-turning torque lever has been developed and put into use for automatically and remotely controlling pipeline and distribution system valves. The new actuator, known as the "tandem type," has been developed to overcome some of the disadvantages of the single-cylinder actuator. It may be mounted either on the valve cover itself, clamped to the valve flanges, or mounted on an outside support; and it may be used with either new or existing installations. Rigid piping is used between the actuator and the controlling device.

Instrumentation

Because of the trend toward instrumentation and the remote and automatic control of valves in both transmission and distribution service, actuators have become an important and independent factor in the design of gas flow systems. With the automatic control of valves divided into the three separate functions of instrumentation of the "sensing" function, control or the "nervous system" function, and actuation or the "muscle" function, the present-day tendency is to look to specialists for each phase of the operation. Engineers and manufacturers who have specialized in the muscle phase of valve control, therefore, have developed package actuators that can be installed on any standard valve and be operated from any one of a number of different instrumentation and control sources.

Tandem type actuator

The tandem type actuator is a development of the Ledeen Manufacturing Co. of Los Angeles, designers and manufacturers of air and hydraulic equipment, and is an outgrowth of their experience with linear or cylinder valve operators.

The automatic operation of valves has recently come into wide use in the gas industry in conjunction with the application of telemetered gas flow information and the remote control of flow valves; in the operation of turbine-driven centrifugal compressor station valves during the starting, shutdown and running cycles; and in emergency shutdown procedure. Operating costs are substantially cut through the use of unmanned metering stations as well as in other types of gas flow control stations along a transmission line. The power operation of valves from a re-

---

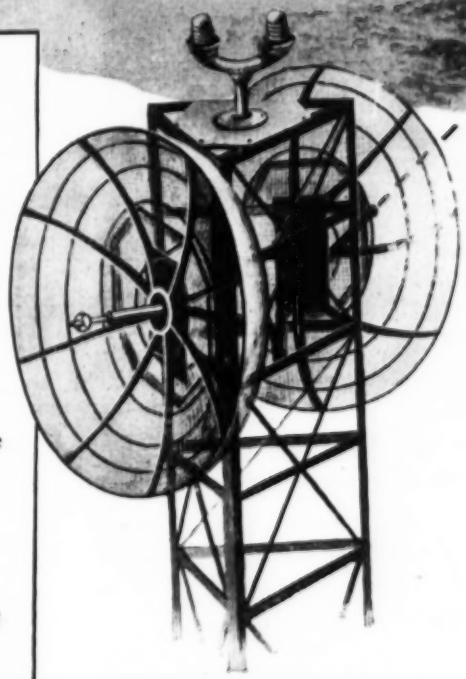
Mr. Toben, a graduate of the University of Grenoble, France came to the United States in 1938 after several years in the automobile industry in France and 5½ years as assistant to Eugene Freyssinet, world's foremost inventor of concrete processes and products and builder of plants utilizing htem. After several years with the Bishop Oil Co. as engineer, he joined Ledeen in 1946 and a short time later was named manager of the air-hydraulic division, his present position.

GAS exclusive

OVER 6,000 ROUTE-MILES of RADIO RELAY SYSTEMS *INSTALLED*

High Points of PTM ENGINEERING and PERFORMANCE

- Pulse-Time Modulation assures maximum circuit reliability.
- Simplest and smallest RF equipment.
- Highest RF power output.
- Fewest tubes—lowest maintenance.
- Simple intermediate drop and insert equipment.
- Simple individual common type channeling units.
- Simple delay line method insures channel synchronization.
- Unaffected by fog, rain, snow, ice, static or magnetic storm.
- High signal-to-noise ratio.
- Outstanding for high quality of voice and other transmission.
- No inter-channel cross-talk due to non-linearity of common elements.
- Energy beamed by non-critical directive parabolic reflectors.
- High power provides large fading margin.
- 99.22% reliability achieved without RF stand-by.



MICROWAVE MOVIES:

Be sure to see Federal's 16 mm. sound-and-color motion pictures:

"Microwave Communications for Power Utilities"..."Pipeline Communications With Microwave"..."Microwave for Modern Telephony"..."Railroad Operation With Microwave"..."Modern Communications With Microwave." Prints shipped without charge for company showings. Write to: *Film Distributing Department.*

SUCCESSFUL operation in many industries proves Federal's PTM is better because of its *inherent simplicity . . . !*

Streamlined circuitry—fewer tubes! That's the basis of Federal Pulse-Time Modulation Microwave superiority... for multi-channel radio relay systems of *any* length . . . over *any* terrain!

Federal PTM gives pipelines, power utilities, telephone companies, railroads and others complete, simultaneous, all-weather voice and signal facilities . . . without costly line construction and maintenance.

Proved-in services include: toll circuits, dialing, dispatching, telemetering, supervisory and remote control, teleprinter, telegraph, speech-plus-duplex, mobile radio . . . in fact, *all industrial communications needs.*

Get the facts about Federal PTM . . . backed by decades of experience in engineering, system planning and turnkey installations. Write Dept. H-2105A.

FEDERAL TELEPHONE & RADIO — FTR — A Unit of IT&T

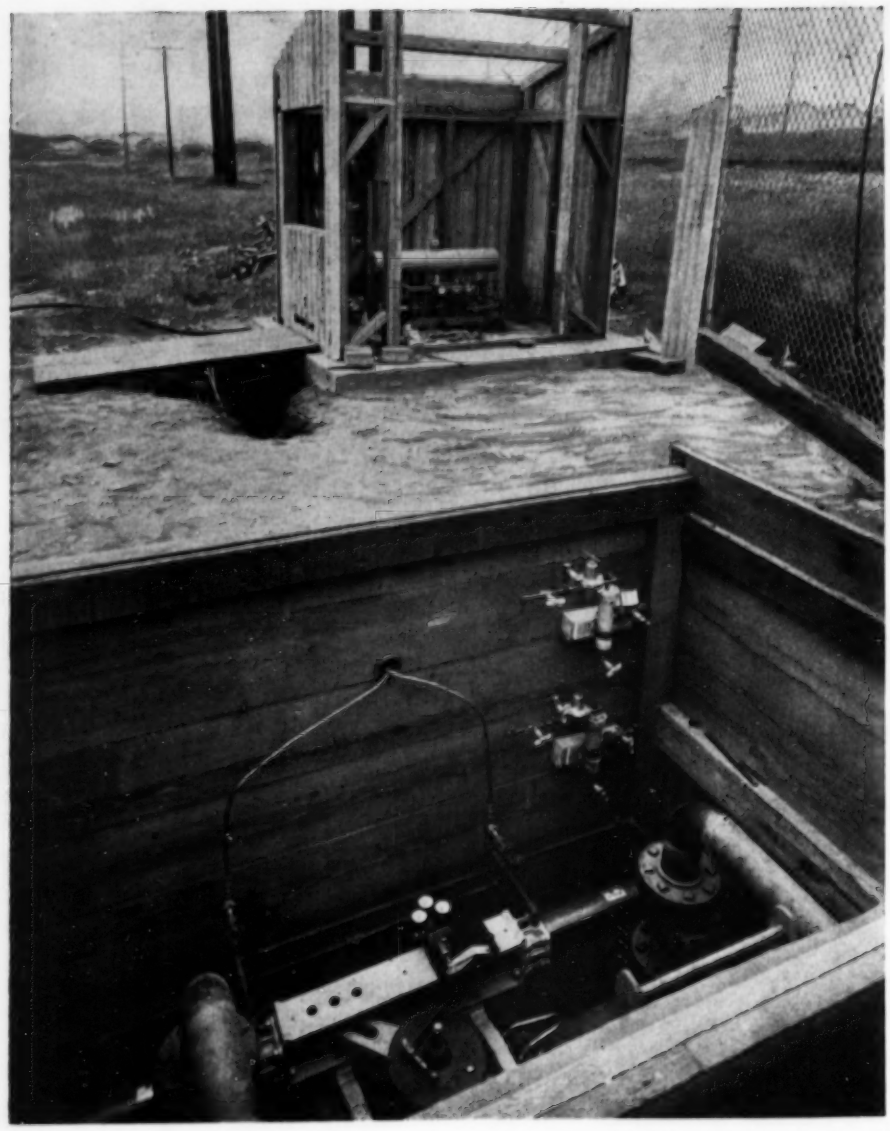
Federal Telephone and Radio Company

PTM AND WIRE TRANSMISSION SALES — 100 KINGSLAND ROAD, CLIFTON, N. J.

In Canada: Federal Electric Manufacturing Company, Ltd., Montreal, P. Q.
Export Distributors: International Standard Electric Corp., 67 Broad St., N. Y.

IT'S A FACT . . .

IT&T scientists conducted the *first* successful demonstration of voice communication via *microwave*, March 31, 1931, across the English Channel.



This is an overall view of the same installation as is pictured in the two photos on page 152. (Station under construction at the time photos were made of the pressure control station of natural gas to Redondo Beach Edison plant.) Air prime mover is shown in the house in background.

mote position is a requisite in this kind of operation. Telemetered information with respect to gas flow rate and pressure is of little value unless coupled with some positive means for altering the flow of gas as required.

Demand for gas

The continuing demand for the delivery of more gas through existing long transmission lines has led to the use of high-capacity, low-ratio centrifugal compressor stations spotted at intervals along the line. The operation of these stations with a minimum staff requires the use of automatically operated valves, particularly during the starting and shutdown cycles. In practice, a single-unit station can be started and put on the line by one man. Mainline bypass valves are automatically closed and station valves automatically opened as the compressor is brought up to operating speed.

In the third consideration, the automatic operation of station shutdown valves and the valves used in blowing down the station piping are incorporated as a safety measure in all stations of this kind. Similar emergency shutdown systems are also incorporated in other installations such as standby propane-air plants, metering and regulating stations.

A new and potentially far-reaching application of the tandem actuator with a plug valve for throttling purposes has recently come into use. In this application the cylinders are filled with a noncompressible fluid and operation is carried out by converting from a gas pressure differential to a fluid pressure. In previous work with gas pressurized valve actuators it was found that because of leakage past the piston cups, because of the static friction of the valve, and because of the compressibility of the gas which caused the piston to "hunt," there were certain practical disadvantages to their use as pressure regulators. The use of oil-filled valve actuators, however, enables very accurate valve positioning and permits the use of a plug valve as a regulator.

Power used to actuate valves in these various applications is provided by several different types of equipment, each of which is suitable to a particular use. Basically, however, the rotating motor and the linear motor are the two types most widely used.

Power mechanization

Rotary actuators are powered by conventional high-speed electric, pneumatic or hydraulic motors that transmit power to the valve stem through a gear train. Linear actuators, on the other hand, use straight-line motors or cylinders that are coupled to the valve stem through an operating lever. Linear actuators have been applied because the movement of a gate or diaphragm valve stem is a relatively short, straight-line motion. A plug or butterfly valve shank can also be operated by a straight-line motor.

The pneumatic or hydraulic cylinder is a simple piece of equipment wherein the piston is the only moving part. A properly designed cylinder is positive in operation and requires a minimum of maintenance. Of particular importance in the presence of gas is the fact that pneumatic- or hydraulic-operated pistons are explosion-proof.

For operation of plug valves, which require a 90° rotation of the valve stem, the power of the actuating cylinder may be transmitted to the valve in several ways. The cylinder can be rigidly installed on a heavy bracket, which is a part of the valve itself, in such a manner that the piston actuates a guided rack that turns a gear mounted on the valve stem. This type of valve actuator must be made a part of the plug valve and, consequently, is used only when the valve manufacturer engineers and builds the entire assembly at the factory.

In many instances, particularly when plug valves are either already in service

treatment

You won't find it described in the books on metallurgy. But it's a mighty important factor here at Claymont in supplying you with carbon and alloy steel plates that are tailored to your specialized requirements.

To us it means *Very Important Plates.* It means individualized supervision of your order . . . particular attention to every detail of analysis, processing and inspection—right down the line from top to bottom.

Let us know your requirements—large or small. Our location in the heart of the Delaware Valley gives us complete access to convenient rail, water and highway transportation . . . enables us to efficiently and economically serve your needs.

CF&I

Claymont Steel Products

PRODUCTS OF WICKWIRE SPENCER STEEL DIVISION • THE COLORADO FUEL AND IRON CORPORATION

2283

ABILENE • ALBUQUERQUE • AMARILLO • ATLANTA • BOISE • BOSTON • BUFFALO • BUTTE • CASPER • CHICAGO • DENVER • DETROIT • EL PASO • FT. WORTH
HOUSTON • LINCOLN • LOS ANGELES • NEW ORLEANS • NEW YORK • OAKLAND • ODESSA • OKLAHOMA CITY • PHILADELPHIA • PHOENIX • PORTLAND • PUEBLO
SALT LAKE CITY • SAN FRANCISCO • SEATTLE • SPOKANE • TULSA • WICHITA • *Canadian Agency Offices At* • EDMONTON • TORONTO • VANCOUVER • WINNIPEG

OTHER CLAYMONT PRODUCTS

Flanged and Dished Heads • Manhole Fittings and Covers
Stainless Clad Plates • Large Diameter Welded Steel Pipe

or where the valve desired is not supplied with actuator assembly, an independent valve actuator is required.

Development of actuator

These considerations have led to the development of the tandem-type actuator. This actuator consists of two cylinders mounted one on each end of a rigid center frame having piston rods joined by a special coupling. This coupling operates the stem-turning torque lever, which slides between free moving rollers in the coupling. Both cylinders are piped together and work as one unit, transmitting their combined power to the torque lever. The balanced design, using two smaller cylinders rather than one larger one, delivers a constant torque to the plug valve stem and permits easy installation on the valve proper.

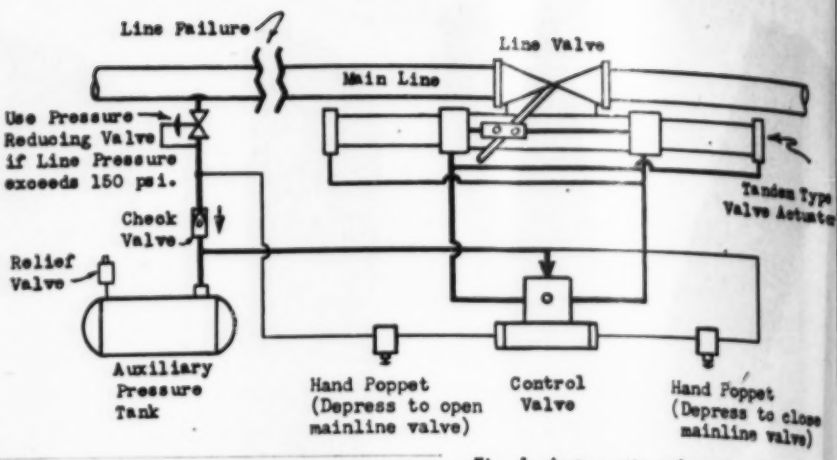


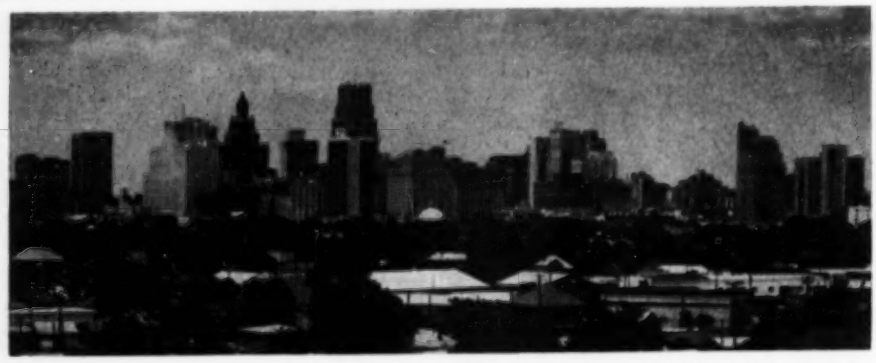
Fig. 1. Automatic safety shutoff of pneumatic actuators in case of line failure.

To obtain the desired action of the linear actuator and the valve, it is necessary to select the proper operating fluid, pressure range and control valve. Selection of cylinder-operating fluid should be on the basis of the type of control desired and the instruments and controls to be used.

Applications

Pneumatic actuators operated by either compressed air or natural gas under pressure are used most frequently for valves that are to be either fully shut or fully open, for safety or emergency installations requiring a source of accumulated or stored energy, and where high precision throttling of the valve is not required. Pneumatic actuators are most efficient for two-position requirements because of the simplicity of the arrangement and the large selection of control valves available.

An example of a mainline installation including an arrangement for automatic emergency shutoff is shown in *Fig. 1*. In this case the mainline valve is operated through two normally open three-way poppets that bleed the pressure off of one or the other side of a control valve. One of the poppets causes the tandem-type actuator to move the valve in one direction, opening the mainline valve, while the other causes the valve to be moved in the opposite direction.

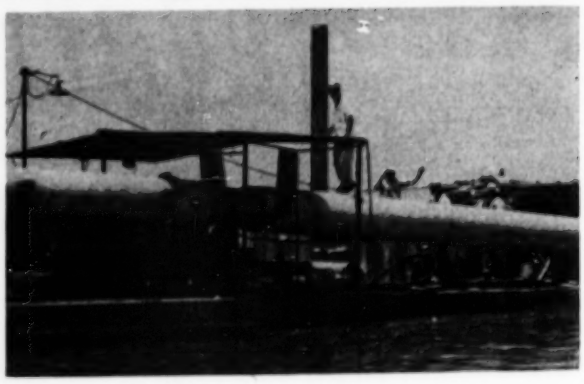


CPS

*CITY OF HOUSTON, TEXAS

PROTECTS...

The transmission lines feeding municipalities and the municipal gas distribution systems they serve.



SOUTHERN NATURAL GAS CO.

*City owned gas distribution system consisting of approximately 250 miles of mains and services (essentially bare) placed under complete protection with distributed magnesium anode system.

Approximately 450 miles of 12" thru 24" consisting of the South Louisiana Project—approximately 150 miles of which was layed in marshy country and off shore with concrete coating—protected by a combination of magnesium anodes and rectifier/graphite anodes.

While the above photographs represent larger CPS installations, other typical installations include: *Booneville, Miss., *Ripley, Miss., Sunset, La., Patterson, La.

HOUSTON
P. O. Box 6387
(4601 Stanford St.)
Phone JA-5171

TULSA
314 Thompson Bldg.
Phone 2-9857

NEW ORLEANS
1639 Robert St.
Phone CH-8310

cathodic protection service

*In these municipal systems cathodic protection was incorporated into the original design by CPS engineers.

Everything in the cathodic protection field . . . from an insulating washer to a turnkey contract installation.

Experienced

PIPE LINE
WESTERN
CONSTRUCTORS
AUSTIN, TEXAS

. . . in laying Pipe Line !

● Experienced personnel is the backbone of any organization. Western Pipe Line Constructors, Inc. has those men of experience . . . men who can lay pipe line anywhere . . . through rivers, swamps or mountains. No job is too big or too rough. Western's men are experienced in laying Pipe Line.

JAMES P. NEILL, *President* • CHAS. S. LeNOIR, *Vice-President* • E. G. MORRISON, *Secretary*

WESTERN PIPE LINE CONSTRUCTORS, INC.

AUSTIN 2, TEXAS

CLEANING, COATING, WRAPPING & RECONDITIONING

★

HOT DOPE

Straight from the Kettle on PIPE PROTECTION

★

By Boyd Mayes

• Read not long ago that the cost of corrosion to industry each year is estimated at 6 million dollars. I don't have any idea how they arrive at it but in the pipe line business everybody knows it's pretty true. That's why when we started the business of coating and wrapping pipe we took a mighty careful look-into seeing that we got the very best in coatings and wrapping — and we got hold of the people with a reputation for doing work right and with products famous for dependability. We figure it's a lot better to have *friends who come back* for our services than *customers who don't.* Seems to us that a man's friends are his best advertisement — while just about anybody with *cash can be a customer* . . . and we just naturally like doing a job that gets praise. In our business we've seen lots of fly-by-nights in products and people and we find it satisfying to keep on using products and people that are tried and proved. Up in the Piney Woods somebody told old Jake that his hound dawg sure looked old — and Jake just said . . . "No—he's just SEASONED." That's what we think of our 26 years in the business too. We hope we have an opportunity to serve you this year. Men of experience and the best of equipment are at your service.

MAYES BROS.

1150 McCarty HOUSTON, TEXAS OR chard 7346

closing the valve. Operating pressure is taken from the mainline through an auxiliary pressure tank.

In the event of mainline failure on one side of the control valve, the power attachment of the control valve is automatically bled through one of the normally open poppets, and pressure from the auxiliary pressure tank shifts the power piston. The control valve is reversed and pressure is directed to the opposite side of the actuator and the mainline valve is closed. The auxiliary pressure tank is normally pressurized by mainline pressure and remains pressure-loaded when the mainline fails through the action of a check valve in the supply line.

automatically with a power failure. In most installations of this kind, however, it is necessary to provide some form of delayed-action circuit to keep the actuator from operating the valve on intermittent outages.

Specialized applications

For emergency use, for the remote control of a valve during a compressor starting cycle, or for other specialized applications where gas or air pressure may not be available for the actuator, a hand-operated hydraulic pump and manual controller may be incorporated with the installation. In such an installation the actuator is normally operated

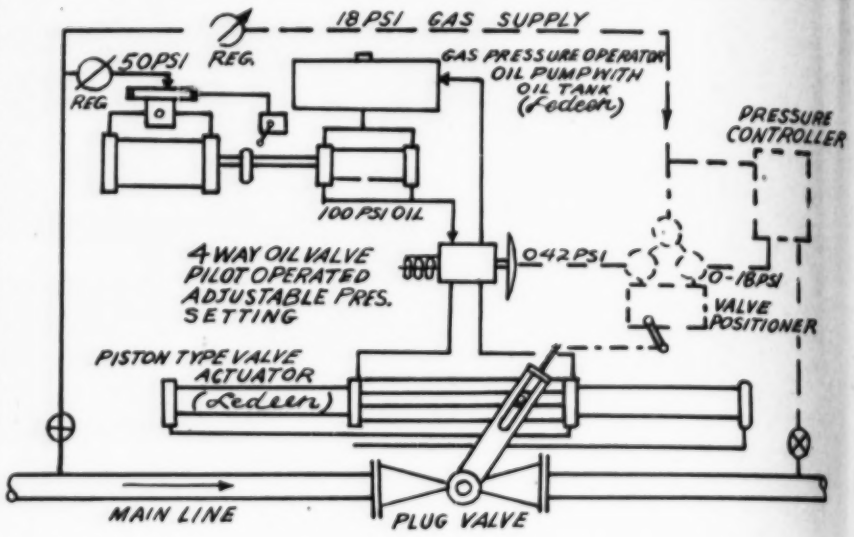


Fig. 2. Installation using oil-filled cylinder with gas-to-oil pressure converter for controlling pressure with a plug valve.

A method of line shutoff in emergency operation by the use of pilot-operated power valve and auxiliary pressure tank is similar to closing the line valve with spring-loaded cylinders. However, since the actuator required is of normal size and standard construction, and is pressure-operated rather than spring-loaded, the operation is both more positive and more economical.

Hand poppets

Hand poppets may also be replaced in an installation of this kind by diaphragm or solenoid-operated pilots. Three-way solenoid-operated pilots requiring low power are available with coils wound for most voltages, both AC and DC. By the use of one permanently energized solenoid in the circuit, it is possible to cause the valve to operate on gas or air pressure in the usual manner. However, the cylinder pistons are cushioned with an oil system that is controlled through a four-way, three-position hand valve with a cam-operated switch. With this valve in neutral position, the actuator operates from gas or air pressure. When the switch is operated in either the open or closed position, the circuit to the gas- or air-operating solenoid is opened to prevent the control of the actuator from this source, and the hand pump is used to manually operate the actuator.

By introducing a differential pressure system (introducing a constant pre-set pressure on one side and modulating the pressure on the other side), a satisfactory throttling action can also be obtained. A certain amount of jumping or hunting, resulting from the resistance to free floating motion created by the friction of the piston and stuff-

"rough country"

Inch by inch best describes the laying of this pipeline through the most rugged kind of rocky terrain. Every foot of this ditching had to be blasted with explosives or broken up by pneumatic jackhammers before the pipe could be put underground.

A job like this is tough on pipeline coatings too. Only the best type of protection will take such abuse. That's why Barrett Coal-Tar Coatings were used on this line. Through soft mud or hard rocks, Barrett Coal-Tar Coatings are designed to provide the best all-around protection you can get. It is significant that a Barrett Protective Coating will prolong the life of steel pipe indefinitely while increasing its cost by only a small fraction. And when you specify Barrett you get the finest protective coatings plus expert technical assistance.

The Barrett Technical Service Group is always ready to assist right from the blueprint and planning stage until the last foot of pipe has been laid. They help in the selection of the right high-quality coating which will give top protection yet keep costs to a minimum. In the field the Barrett Service Representative is right on the job—checking, advising and supervising preparation of the pipe and application of the coating right to the end of the line.

We welcome the opportunity to place the Barrett Technical Service Group at *your* service. For detailed information—phone, write, wire Barrett.

Approved Barrett Applicators are available for field or special work throughout the country. BARRETT DIVISION, Allied Chemical & Dye Corporation, 40 Rector St., N. Y. 6, N. Y. In Canada: The Barrett Company, Ltd., 5551 St. Hubert St., Montreal, Que.

Allied Chemical

1854 1954 CENTENNIAL Barrett 100 YEARS OF EXPERIENCE

BARRETT PROTECTIVE COATINGS

CHEMICAL PROGRESS WEEK, MAY 17-22

See "QUICK-WAY" Truck Shovels

Offering Sensational Engineering Advancements with Traditional "Quick-Way" Simplicity of Design, Interchangeability of Parts, and Rugged Construction

New Features—Models L2 and E2

NEW FULL VISION CAB • All Steel, with safety glass. 360° vision. Controlled ventilation. More comfort.

NEW CLUTCHES • Reversible shoe, improved "roll-in," self-energizing, single adjustment type. All interchangeable.

NEW BRAKES • Automotive type pedal action. Increased leverage. Positive effortless braking power.

NEW CENTER PIN THRUST WASHERS • Heat treated. Encased in oil tight pans. Long life and easy swing due to submerged lubrication in light weight oil.

NEW SWING ROLLERS AND SWING ROLLER PINS • The conical, high alloy steel swing roller and roller pin diameters have been increased. All four rollers and pins are interchangeable and easily removable. Hardened rollers and pins on Model L2 equipped with large, permanently lubricated ball bearings, Model E2 equipped with large antifriction phosphor bronze bushings and both with submerged center pin thrust washers give the operator smooth, easy, effortless swing. (Hardened rollers and pins with permanently lubricated ball bearings available for Model E2 at extra cost.)

NEW GEAR PANS • New design oil-tight pans encase engine, jack shaft, and main hoist drive gears.

NEW CONTROL CABINET • New design with independent self-filling hydraulic cylinders on each control line. Due to increased leverages in the hydraulic application, greater pressure is transmitted with less effort. Improved clutch lock-in system.

NEW CONTROLS • All control levers, large brake pedals, clutch throwout lever, house lock lever, throttle, etc., have been conveniently grouped with the operator's comfort and additional ease of operation in mind.

NEW HOUSE LOCK CONTROL • New foolproof and positive over-center house lock control. Designed for greater ease of handling and conveniently located for operator.

NEW SET-BACK GANTRY • Bridge type, all-welded construction. Allows better vision, makes crane work easier.

NEW FLOOR FRAMES,
NEW SIDE FRAMES,
NEW COUNTERWEIGHT.

CAPACITY • Model L2: ½ cu. yd., 10 ton crane. Model E2: 4/10 cu. yd., 7½ ton crane.

New Features—Model S2 & J2

Now equipped with NEW BRAKES, NEW CONTROL CABINET, NEW CONTROLS as described above, and NEW CLUTCHES with new increased fulcrum leverage insuring easy energizing clutch action with less effort to the operator.

CAPACITY • Model S2: ⅓ cu. yd., 5 ton crane. Model J2: ¼ cu. yd., 3 ton crane.

Fully Convertible to...

Trench Hoe	Pile Driver
Crane	Magnet
Shovel	Front Dump Shovel
Dragline	Hammer Drive
Clamshell	Clam

Backfiller Blade, Orange Peel, Scoop, Snatch Block, Self-cleaning Trench Hoe Bucket, Telescoping Boom, Log Grapple, Hay Fork, Skull Cracker, and many other special tools available. *Mounted on your own truck or complete with new truck of your choice.*

"QUICK-WAY" Truck Shovel Co.
DENVER, COLORADO, U.S.A.

Mail Coupon Today!

ing box, can be expected from pneumatically operated cylinders. The cylinder required for throttling action must be twice the normal size and may become impractical. In such cases a combined air-hydraulic operation can be applied to good advantage. Pneumatic pressures of 50 to 150 psi are most convenient to use because of availability, the selection of cylinder controlling valves made for this pressure range, the use of inexpensive piping, and general safety considerations.

Locked in position

In addition to the fact that a noncompressible hydraulic fluid can more positively accomplish a throttling operation, the actuating cylinder can also be locked in any desired intermediary position simply by moving a four-way control valve to neutral, thus immobilizing the piston.

Conventional hydraulic power units are rotary type using motor-driven pumps of constant or variable displacement. The speed of motion of the hydraulic actuator is a function of the pump displacement and, therefore, an important consideration in the selection of the power unit. Rotary power units are convenient and economical in plants where valve-actuating controls are located close to the unit and where the operator can conveniently start and stop the motor after having moved the valve actuators to the desired position.

Automatic control

For automatic instrument control of valves or in remote locations, this is often not convenient or practical. In such cases the recently perfected pneumatically powered reciprocating hydraulic pump is considered the best answer. Pumps of this kind can be operated by either air or natural gas, they are self-starting, and go into action automatically when the controlling valves are shifted. When the actuator reaches the end of a stroke, or when the control valve returns to neutral position, the pump reaches a pre-set maximum output pressure and automatically stops. Control of the speed of the pump is simple and the control of maximum output pressure for a specific pump is reduced to the setting of the pneumatic regulator on the input air or gasline. The pumps are rugged, hold indefinitely, and are available with a wide range of output pressures and displacements.

Additional considerations with re-

PIPELINES

Across the nation

- Products Pipelines
- Oil Lines
- Water Pipelines
- River Crossings
- Gas Pipeline Construction

R. H. FULTON & COMPANY
CONTRACTORS

PHONE 5-5231 BOX 1542

LUBBOCK, TEXAS

spect to the selection of a cylinder-operated actuator and the use of a gas-operated pump were brought out by F. M. Partridge and G. C. Wilson in their article on "Positioning of Piston Operated Valves" (see *GAS* for September 1953, page 97). The authors found that the most satisfactory solution from the standpoint of both suitable valve action and cost was the use of a hydraulic cylinder actuator powered by a small, reciprocating gas-driven pump controlled by a small pilot-operated four-way valve with a neutral position.

A complete installation that makes use of an oil-filled cylinder with gas-to-oil pressure converter for controlling pressure with a plug valve is shown in *Fig. 2*. In this service the tandem-type actuator is modified slightly by the use of a coupling with one pin and roller instead of two and a split lever to eliminate all lag in the operation of the valve. Gas is taken from a point upstream from the valve to operate the gas-to-oil pressure pump. Only a small amount of gas is required to operate the pump.

A reading on downstream pressure is taken into a pressure controller and applied through a valve positioner to an oil valve. The control pressure at the valve positioner varies from zero to about 18 psi (as an example) and is used to modulate a constant low pressure from the upstream side of the valve. The four-way oil valve is an adjustable type that may be set to operate the valve actuator on any desired pressure differential. It is this progressive control valve that controls the flow of oil into the valve actuator. An oil storage tank that is open to air is used in conjunction with the gas-to-oil pump.

Versatility

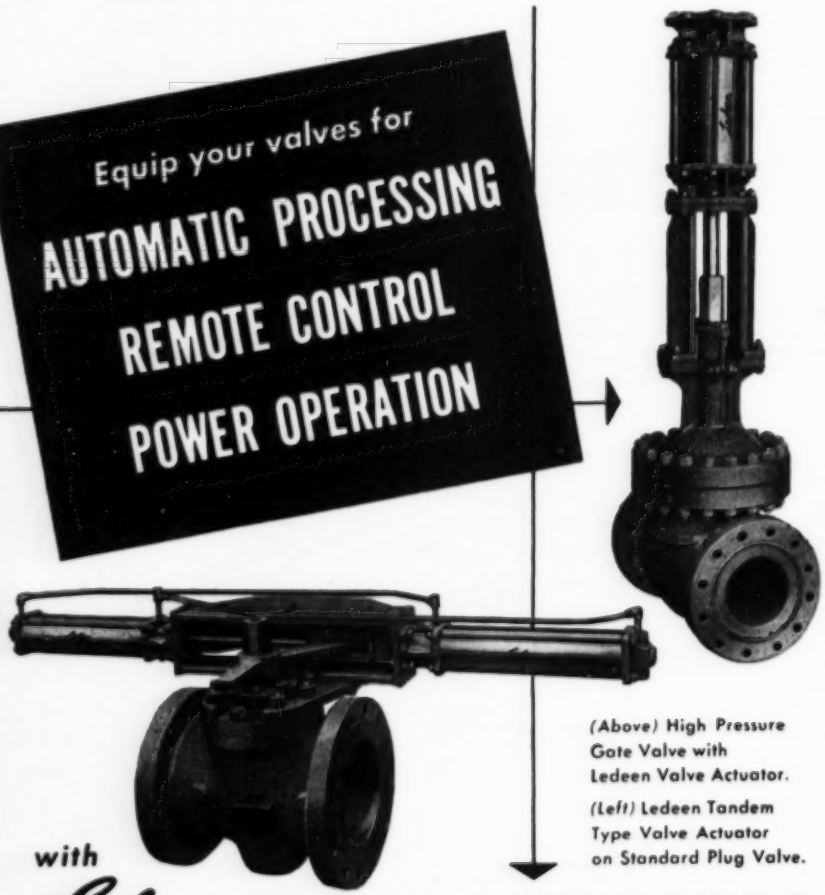
The gas-to-oil pump is a versatile piece of equipment in connection with this application. It may be used to increase or decrease the operating pressure in making a conversion to oil pressure. The ratio or gas-to-oil pressure is a function of the comparative size of the two cylinders.

If required, the pressure controller may be arranged so that the set point can be changed from a remote point over a telemetric circuit. The controller has a special spiral cam instead of the usual time cam. The cam in this instance is rotated with a reversible direct current motor controlled from a remote location by reversing the direction of current flow in the telemetric circuit.

The use of the tandem actuator for the positioning of valves opens up a new field of applications. The smooth operation of valves from a remote location and the control over starting that is afforded by high pressure liquid makes the device applicable to a variety of operations.

Equip your valves for

AUTOMATIC PROCESSING
REMOTE CONTROL
POWER OPERATION



(Above) High Pressure Gate Valve with Ledeen Valve Actuator.

(Left) Ledeen Tandem Type Valve Actuator on Standard Plug Valve.

with

Ledeen VALVE ACTUATORS

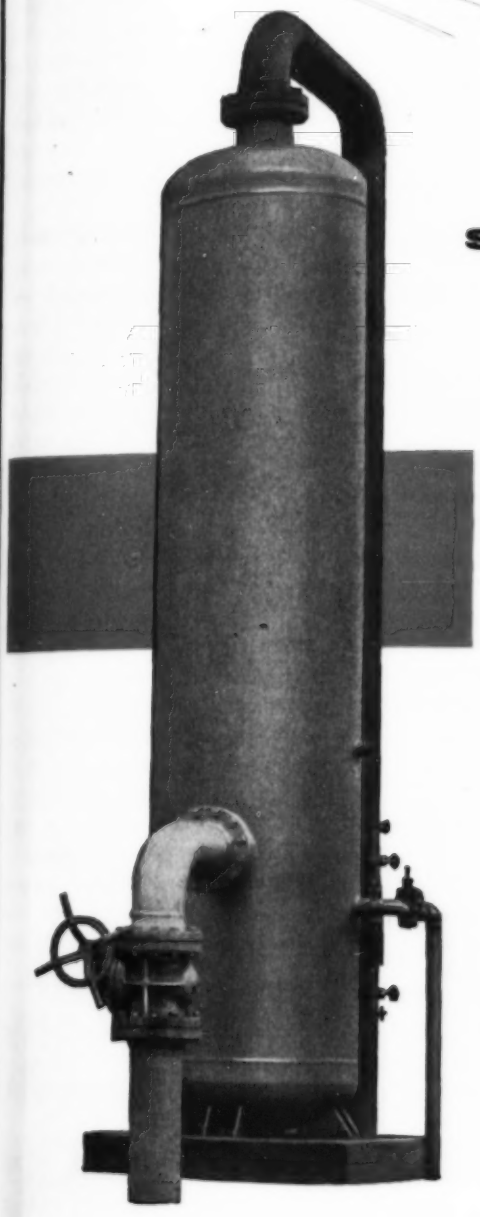
★ Simple, Rugged Construction.
★ Few Moving Parts.
★ Easily Installed.
★ Prompt Delivery.

These actuators are for the automatic operation of gate, diaphragm, plug and other line valves, and are pneumatically or hydraulically operated for direct or remote control. Designed as package units, they are mounted directly on the valves without need of special manifolds or outside supports. They are easily, quickly and rigidly installed on new valves or on valves in service.

Ledeen Valve Actuators provide positive operation, permit automatic processing, safety installations, multiple central control and require a minimum of maintenance. WRITE FOR BULLETIN 3000.

VALVES • CYLINDERS
VALVE ACTUATORS
AIR HYDRAULIC
PUMPS & BOOSTERS

Ledeen Mfg. Co.
1608 So. San Pedro St.
Los Angeles 15, Cal.



Blaw-Knox gas cleaner saves $3600 a year in maintenance costs

For over 31 years, the compressor station illustrated above pumped an average of 3 million cubic feet of gas per day from Western Pennsylvania wells. During that time, damage to compressor parts from entrained dust cost the company $3600 a year.

This figure does not include costly damage to meters and regulators in the distribution system, the revenue lost as unmeasured gas or the expense of cleaning out service lines and pilots.

Since 1942, when a Blaw-Knox Gas Cleaner was installed, maintenance resulting from pipeline dust has been negligible. Dust removed from the cleaner has averaged 11 bushels every three months, or over 30 pounds a day.

Field tests repeatedly have shown that outlet gas from Blaw-Knox Gas Cleaners is free of dust, regardless of the quantity or particle size entering the equipment.

The low maintenance cost and remarkable efficiency of Blaw-Knox Gas Cleaners are the result of a unique oil scrubbing principle, coupled with continued design improvement based on careful field and laboratory study.

When you buy, specify Blaw-Knox. You'll be sure to remove even the finest particles of dust.

The new Blaw-Knox Bulletin No. 2450 contains complete information. Write for it.

BLAW-KNOX COMPANY

Blaw-Knox Equipment Division
Gas Equipment Department
Pittsburgh 38, Pennsylvania

LONE STAR IS
EQUIPPED TO HANDLE
ANY SIZE PIPE PROJECT!

CROSS COUNTRY
PIPE LINE
CONSTRUCTION

PIPE LINE
RIVER CROSSINGS

TAKING UP-
RECONDITIONING
OLD PIPE LINES

LONE STAR
CONSTRUCTORS

Paul R. Halbert N. K. McFarland

OFFICE AND WAREHOUSE
10301 SHADY TRAIL
DALLAS 20, TEXAS PHONE FL7-2833

Men and Equipment
For Your Next
Pipeline Job

SINCE 1926

RAY L. SMITH
& SON, INC.
PIPELINE CONTRACTORS
EL DORADO, KANSAS

Pipeline Communications and Electronics

By FRANK CHAPMAN

From drilling derricks to microwave towers

Frank Chapman

At first glance there appears to be nothing unusual about the fact that one of the first companies to build a steel oil field derrick should come to be one of the foremost manufacturers of microwave towers. In fact, because of the apparent similarity in construction between the two products one would be inclined to trace an easy course from the manufacture of one to the design and manufacture of the other.

However, because of certain important design defferences between the two, this is not the case. Although Emsco Manufacturing Co has become one of the outstanding manufacturers of microwave towers for the gas industry, the development of one from the other has not been a natural course. Instead, it has been a case of where engineers with wide basic experience in tower design have applied their knowledge to the new and different problems presented by the design of towers for microwave service.

The design problems presented by the two products were, in fact, so different that Emsco, with all its experience in drilling derricks, was at first reluctant to enter the new field. It was upon the insistence of gas pipeliners, who were at the time becoming deeply involved in microwave, that the company embarked upon a program of tower design.

The essential differences in the design of the two products bear an interesting relationship to each other and explain, at least in part, why the design considerations relative to one could not be directly applied to the other. It is estimated that the weight-handling capacity is 90% of the design of a drilling derrick with wind loading and other miscellaneous considerations making up the remaining 10%. In the design of microwave towers, on the other hand, the situation is reversed with 90% of the design for wind loading and the remaining 10% for weight handling and miscellaneous considerations.

In the design of drilling derricks for heavy loading, it is necessary to use heavy materials for the legs, girths and diagonals. The fact that these heavy members tend to increase the wind resistance of the rig and cause it to have more twist and sway with the wind is no major concern. The drilling derrick is, after all, primarily a weight lifting device.

However, with microwave towers the problem is considerably different. Because of the small angle of radiation used in microwave transmission circuits a slight deflection of either the transmitting or receiving antenna can cause a substantial reduction in gain and possibly result in the circuit becoming inoperative. For this reason, any movement of the top of the tower that supports the dish or radiator must be minimized under all weather conditions. Where towers are subject to icing conditions, for example, the design must take into consideration the additional

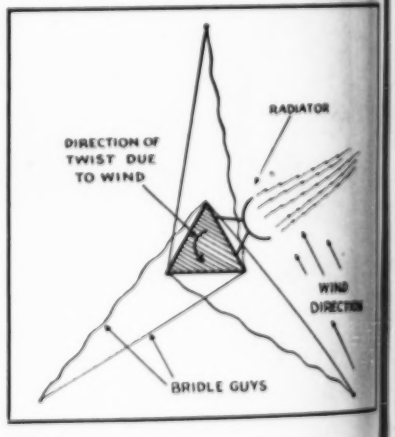


Fig. 1.

Although that may not be true in every case, the petroleum industry has awakened to the tremendous economies of pipeline transportation. Today, companies like SHEEHAN PIPE-LINE CONSTRUCTION occupy an important place in planning for increased production.

With Sheehan, laying a length of pipe has become a science of high performance. Through 32 years of practical experience the company has built its reputation for getting the line through "on schedule". The best manpower . . . the best equipment . . . the best pre-planning have overcome the toughest pipelining problems the field had to offer.

Pre-plan for pipeline progress . . . have SHEEHAN bid your next pipeline construction job.

A refinery going in means a pipeline must go out . . .

SHEEHAN PIPE LINE CONSTRUCTION CO. TULSA OKLA

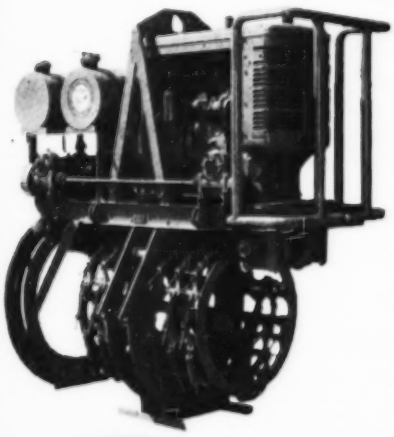
SHEEHAN

Natl. Bank of Tulsa Bldg. • Tulsa, Oklahoma

Model CPF—for 2" to 8" pipe.
Model M —for 3" to 14" pipe.
Model K —for 16" to 26" pipe.
Model R —for 30" to 31" pipe.

CROSE LINE-TRAVELING CLEANING AND PRIMING MACHINE

Rugged and Dependable



The most rugged and dependable cleaning and priming machine on the line . . . equipped with dual multi-speed transmissions providing greater flexibility of control. Interchangeable cleaning and priming assemblies permit each model to process a wide range of pipe sizes.

M. J. Crose Manufacturing Company, Inc.

2715 DAWSON ROAD • TULSA, OKLAHOMA • U. S. A.

BRANCH OFFICES: HOUSTON • NEW YORK • NEWARK, N. J. • EDMONTON • DENVER

SPECIALIZED EQUIPMENT FOR THE PIPELINE INDUSTRY

size and resultant increase in wind resistance of ice-coated members.

This consideration dictates the use of small members rather than large in the design of towers for microwave service. Since microwave radiators are comparatively light, the matter of weight loading is a minor consideration and small size legs, girths and diagonals may be used.

In the choice of a microwave tower for a specific location it is necessary to take into consideration the section of the country where it is to be located, the altitude and other factors that have a bearing on the conditions under which it is to be used, and the weight and size of the radiator that it is to support. If the tower is to be located in a congested area it is likely that an unguyed tower must be used whereas a guyed tower will be preferred in a location where there is enough space. Both the possibility of icing conditions and the use of heavy radiators require design for greater weight load. High altitude locations and oversize radiators demand a design for higher than normal wind loading.

In order to satisfy this variety of conditions Emsco has designed several different towers, any one of which may be altered to the extent required for any given set of requirements. Unguyed towers may be supplied with three or four legs and guyed towers may be provided with a varying number and spacing of guys.

With respect to guyed towers, Emsco makes use of a bridle type guy connector that holds the tortional deflection of the top of the tower to a minimum. As shown in *Fig. 1*, the guying arrangement uses a pair of guys for each side of the tower that are anchored in a reverse direction. In this way any tendency of the tower to twist because of the wind will cause three of the guys to tighten. The arrangement will hold the deflection of the top of the tower to within about 1½°. Conventional guys are used on the lower part of the tower.

Whatever It Is...

Wherever It Goes...

PARKHILL Knows...

How To Handle Your Hauling Job!

Whether It's Pipe, Oil Field or Pipe Line Supplies,
Construction Equipment and Materials,
Fabricated Steel or Industrial Machinery . . .
PARKHILL Service Will Save You TIME, MONEY AND WORRY.

JUST PARK YOUR PROBLEM WITH PARKHILL AND FORGET ABOUT IT

PARKHILL TRUCK COMPANY

TULSA, OKLAHOMA

P. O. BOX 1856 **PHONE 54-6159**

Channel splitting requested

A proposal that would double the number of radio channels available to the petroleum industry in the 25-50 mc. band by reducing channel separation from 40 kc. to 20 kc. has been filed with the FCC by the Central Committee on Radio Facilities of the API.

The plan submitted by the central committee, according to its special representative, will allow users now operating equipment with a 40 kc. separation to continue using such equipment, without modification, for at least one year after the change has been adopted. Subsequent to this one-year period, users would be required to stay within a plus or minus 5 kc. of the new deviation requirements.

More on microwave reallocation

A variety of opinions have been received by the Federal Communications Commission in the matter of the reallocation of frequencies above 890 mc. between private and common carrier users of microwave. According to the special representative of the Central Committee of Radio Facilities of the API, Motorola, Philco Corp., the National Committee on Utilities Radio, the National Forest Industries Communication Committee, the Special Industrial Radio Services Association and the central committee all urged that the commission defer the reallocation proceeding until results of the RETMA and the central committee reports on microwave problems have been published and evaluated.

Both the Radio-Electronics-Television Manufacturers Association and the central committee have questionnaires asking for

formation and recommendations regarding technical microwave equipment standards under preparation and ready for distribution to their respective memberships. The survey is being made pursuant to an FCC request.

The American Telephone and Telegraph Co., according to the special representative of the central committee, took the position that "the Bell system has had under way for a long time a comprehensive program directed toward the effective utilization of frequencies within this range providing telephone, television and other communication services on a common carrier basis," and that the reallocation should not disturb or adversely affect this extensive program.

It is also reported by the special representative that both Motorola and the central committee, although taking the position that action should be postponed in this matter, pointed out that if the commission does take action prior to the completion of the RETMA and central committee reports, provision should be made for land mobile radio operation in the 890 mc. region. The AT&T was of the opinion that common carriers have a present and future need for the full band from 890-940 mc. It was also recommended by the AT&T, according to the special representative, that the band from 6425-6575 mc. be allocated exclusively for common carrier fixed and mobile service, while the central committee and Motorola suggested that this band be combined with the present 6575-6875 mc. band to form a single band 450 mc. wide for frequency diversity systems.

Du Mont enters mobile radio field

With the appointment of Fred M. Link as director of operations of a newly formed mobile communications department, Allen B. Du Mont Laboratories Inc. recently made its bow into the mobile radio field. The announcement was made by Herbert E. Taylor Jr., manager of Du Mont's communications products division.

Mr. Link has long been an outstanding figure in the communications industry and a former president of Link Radio Corp. He will supervise market development and the distribution of Du Mont mobile and fixed station radio equipment in all major markets.

Two complete radio systems, one for the 25-54 mc. band and one for the 450-470 mc. band, have already been announced. A third mobile system designed for the 147-174 mc. band is presently under development and will be announced in the near future.

The newest of the two units, that designed for 450-470 mc., makes use of a special UHF antenna transfer relay that is expected to improve RF transfer efficiency. Interference with UHF television service is minimized by means of a low pass filter in both receiver and transmitter. The extremely compact main assembly consists of the power supply chassis and transmitter-receiver unit.

Pipeline News

Niagara-to-Toronto line to be ready by Nov. 1

Under the terms of its contract, the Consumers' Gas Co. must have its natural gas pipeline from the Niagara border to Toronto built by Nov. 1, the Canadian House of Commons' railway committee was told recently.

This information was given the committee as it approved two private bills that provide the basis for the piping of American gas into Toronto this year with a switch to Alberta gas by (it is hoped) the end of 1956. The bills now go back to the Commons for final approval.

The next stage in the setting up of the natural gas transmission system will be started shortly before the Board of Transport Commissioners. The board will hear the application of Trans-Canada Pipelines Ltd. to build, first, the Niagara-Toronto line to service the Consumers' company and then the line which will eventually bring Alberta gas to Ontario and Quebec.

As soon as the board gives its approval, work can be started on the Niagara-Toronto line. However, many contractural and other arrangements must be made by Trans-Canada

A GOOD START.. for a Long Life!

● This RUBEROID pipe line asbestos felt over PITT-CHEM hot applied tar base coating will withstand the severe corrosion attacks this pipe line may meet. The quality control to rigid specifications of these products assures years of protection for this line against moisture and electrical forces, as well as soil stress and root attack. And when you start a job, a Day man is there to give the benefit of his experience for a good start . . . part of the *plus* in the service you get when you "DEAL WITH DAY."

Both of these products are stocked in Houston for immediate delivery when you're in a hurry.

Engineering counsel, literature including specifications, and prices are furnished through our Houston office.

S. D. Day Company is National Distributor for The Ruberoid Co. pipe line asbestos felt, and Gulf Coast Distributor for Pittsburgh Coke & Chemical Co. hot and cold applied coal tar coatings, and American Coating & Supply Company "Fieldjointers."

The Pipeliner's Friend says,

"Get Formula 291 — it gives skin protection for those working where fumes may be toxic."

S. D. DAY COMPANY

1973 WEST GRAY HOUSTON, TEXAS PHONE JU 2431

before it starts the $300 million all-Canadian project, the longest natural gas line in the world. It is hoped that construction of this line can be commenced not later than the spring of 1955.

Storage capacity increased 12-fold in past decade

The ultimate capacity of existing underground storage pools has been increased by 1190% in the past decade, according to the 1953 report issued by the AGA underground storage committee. Underground storage reservoirs have been expanded from 135 billion cu ft estimated total ultimate capacity in 1944 to approximately 1.7 trillion cu ft last year.

Ultimate capacity of existing storage pools was increased by 35%, from 1.29 trillion cu ft in 1952 to 1.74 trillion in 1953. New pools currently under construction will have an additional ultimate capacity of 315 billion cu ft. By the end of last year there were 167 underground storage pools operating in 17 states, compared with 50 pools in 11 states during 1944.

Input to underground storage for the year ended October 1953 was 403 billion cu ft, compared with output from storage of 233 billion for the same period.

Of the three main categories comprising ultimate capacity of existing reservoirs, most of it was working gas (982 billion cu ft), constituting the total maximum gas available for immediate use. Next came 496 billion cu ft of cushion gas and 260 billion cu ft of native gas, which had been left in original natural gas wells.

The survey showed that 37 companies conducted underground operations in 1953. The number of active wells, from which stored gas was withdrawn, was increased in number from 4940 to 5789 last year. Principal geographic distribution of storage pools is: 55 in Pennsylvania; 28 in West Virginia; 14 each in New York and Kansas; 12 in Michigan; 11 in Ohio, plus 33 other pools in 11 states.

Kentucky rejects bill to tap gas pipelines

A bill that would have compelled gas pipeline companies to furnish, upon request, service to any resident of a county through which the line passes was vetoed recently by Kentucky's Governor Wetherby as "not in the public interest." The measure would have required the person requesting gas service to build his own connecting line; the state PSC would have fixed rates to be charged these customers.

In his veto message, the governor declared "Under the wording . . . the PSC is granted authority to fix rates, but such grant inferentially precludes the commission from prescribing safety rules and regulations governing the type of service proposed.

". . . Gas service from high-pressure lines is necessarily hazardous and should be controlled by proper safety standards . . . If the commission does not have jurisdiction, improperly installed or operated . . . connections would constitute a serious hazard.

"The bill gives the right to any person, which might include another utility, or even a municipality using large quantities of gas, to demand service from a privately owned company operating in their county. The exercise of such a right could very seriously affect existing service to other consumers in Kentucky and make it impossible for a gas pipeline company to fulfill its present contractual commitments."

Gas firms must pay rights-of-way rent

Rights-of-way granted utilities across public lands, including school properties, do not prevent the government political subdivisions from charging annual rentals for such privileges, the Mississippi Supreme Court has held in a Covington county case.

In his opinion, Justice Olney Arrington said in support of the holding that "an uncompensated grant would be in violation of a constitutional prohibition against the donation of lands belonging to or under the control of the state." Although Justice Arrington said the decision was confined to the

STATION CONSTRUCTION

Integrity and experience are two basic factors in our completely integrated organization, specializing in the construction of pump stations, gas compressor stations, tank farm systems and terminals.

STATION CONSTRUCTION COMPANY

General Contractors

J. B. LATHAM, *President*

2518 DREXEL DR., HOUSTON, TEXAS

CRUDE OIL • OIL PRODUCTS • GAS & WATER PUMP STATIONS • TANK FARM SYSTEMS • TERMINALS

case in contest, Justice W. G. Roberds in a dissenting opinion, said it was applicable to all utilities for easements over public lands back to 1890 when the constitution was adopted.

The decision upheld the assessment of annual rentals against Willmut Oil & Gas Co. and the United Gas Pipeline Co. for a right-of-way across certain school lands.

TIPRO tees off again at gas pipeline companies

Gas pipeline companies once again found themselves on the receiving end of some well-aimed potshots when the Texas Independent Producers & Royalty Owners Association held one of its typically tempestuous annual meetings in Houston last month.

Among the barbs leveled at the so-called "pipeline monopoly" were a handfull of resolutions calling for action on gas matters ranging from opposition to the eminent-domain-for-underground-storage legislation in Washington to a proposal that the Texas legislature set minimum field prices along the lines of Oklahoma and Kansas regulations. Other campaigns covered in the resolutions were an attempt to modify dedication contracts which prevent royalty owners from electing to take their royalties in kind instead of cash; a study of the dedication requirements of FPC in approving new gas pipelines with a view to making it easier to change long-term price contracts; and a campaign to make producers "Btu conscious" as a means of raising price levels.

Retiring President M. D. Bryant of San Angelo threw down the gauntlet in his annual report. "One of our biggest jobs . . . is to do something about the deplorable condition of the gas industry," he declared.

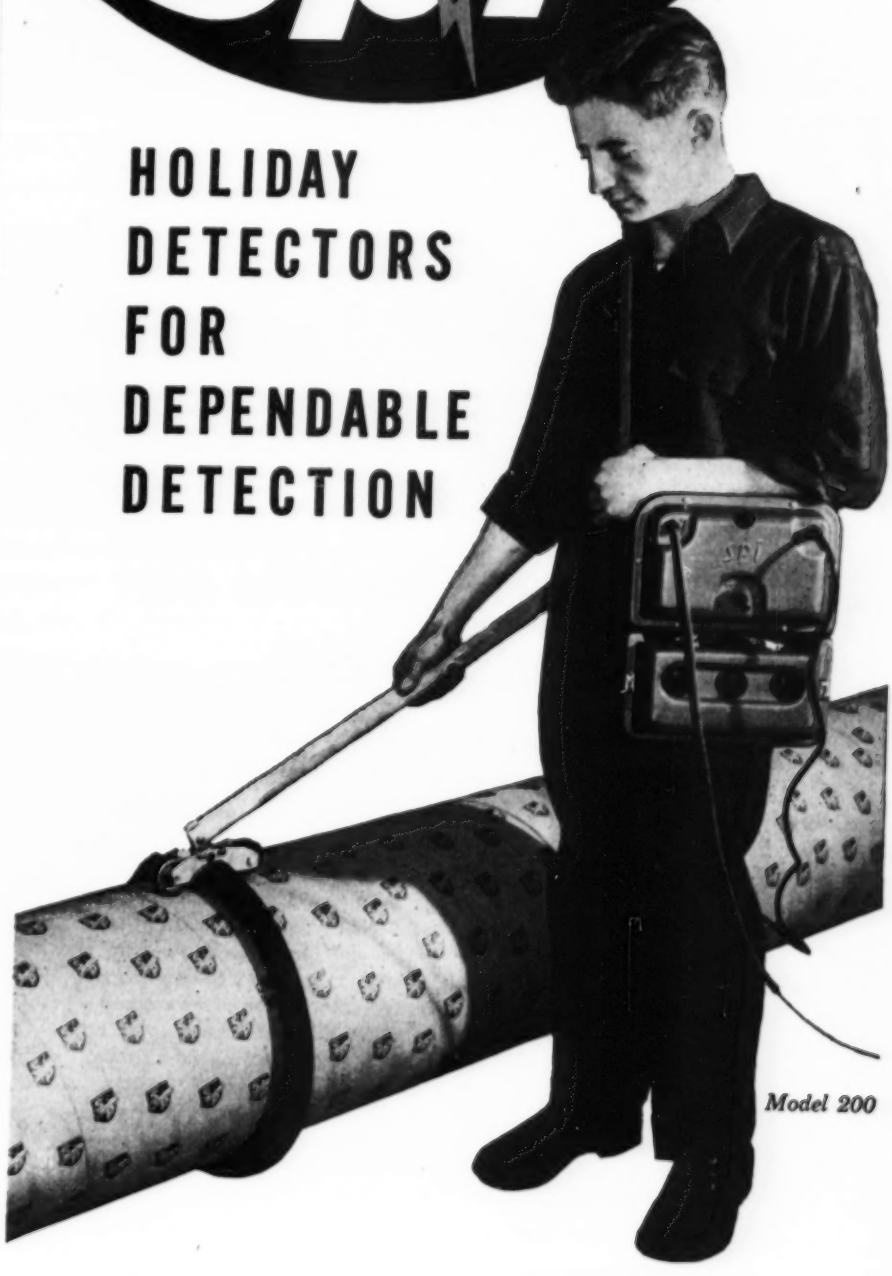
"The very fact that natural gas producers and royalty owners, already taxed at a rate far in excess of other industries are a primary tax target in the special session now underway is symptomatic of an unwholesome condition. Natural gas, everybody knows, is not contributing to Texas and to Texans anything approaching a fair return . . . and that isn't because the tax on it is too low by any logic with which I am familiar. The reason there is so much pressure to increase the production tax on gas is that we are getting virtually nothing for so much of it.

"Throughout this year we of TIPRO pressed toward our broad goal of relaxing wellhead prices from the conditions that hold the statewide average at less than half the going price for free gas. How can the utility companies remain indifferent to the fact that since 1945 our production has exceeded our reserves growth? . . . that cheap Texas gas is subsidizing eastern industries and consumers to the detriment of Texans? . . . that the rate of growth of gas exports is excessive, with some 64% of transmission line gas and 49% of all marketed gas going out of Texas? . . . that much of the underground storage projects in the

RELY ON

spi

HOLIDAY DETECTORS FOR DEPENDABLE DETECTION



Model 200

Constant research and development sustains its many advantages over all other detectors on the market.

Also manufacturers of Model 400, rolling type.

For lease or sale—write

® standard pipeprotection inc.

3000 SOUTH BRENTWOOD BLVD. • ST. LOUIS 17, MISSOURI

East are economic only because these companies dictate Texas wellhead prices? . . . that it is impossible to practice maximum conservation until the price of gas is freed at the well? . . . that the producer and royalty owner receive less than a tenth of the price consumers pay for gas? . . . that gas at the well sells for one-fourth the price of fuel oil and two-fifths of the price of coal at the mine?

"Most of our Texas gas is already dedicated on long-term contracts, a requirement of the Federal Power Commission, and already we have cases of Texas users having difficulty in finding supplies for home use. This dedication requirement may be good.

"Some progress toward this goal was made this year, and I think it is attributable in almost all cases to our insistent pressure. We struck a major blow when we successfully sponsored the Standard Gas Measurement Act.

TIPRO, perhaps more than any other organization or person, is responsible for the attempt to have pipeline companies share with producer and royalty owners the state gas tax burden. The pipeline companies, with a few exceptions, chose to attack that gas gathering tax in the courts, while leaving a similar one uncontested in neighboring Louisiana. Now it appears we face another increase in the already excessive production tax, which, as bad as it is, might be preferable to some other gas taxes on producers and royalty owners . . . and nothing yet has been done about these extremely low prices."

Gas production tax raised during Texas session

As passed by the House and the Senate during the special session of the Texas legislature, a new tax bill will increase the tax on production of natural gas from 5.72% to 9% of wellhead value, starting next Sept. 1, to raise an estimated $14 million a year. It will decrease to 8% and 7% the permanent rate in the following two years.

Senators rejected an attempt to limit the gas tax increase to one year only and another attempt to write into the bill a new tax on gas reserves dedicated to pipeline use. The latter attempt embodied one for which the Senate voted in 1951 but which was rejected later in favor of the gas gathering tax.

Montana-Dakota would serve North Dakota towns

Montana-Dakota Utilities Co., Minneapolis, has applied to the FPC for authority to construct facilities to supply gas to Regent, Mott, New England, and Lefor, N. D., and to enable it to purchase additional gas in the Big Horn basin in Wyoming and sell gas to the Montana Power Co.

The new facilities in North Dakota (Docket G-2397) will consist of about 56 miles of pipeline in Hettinger and Stark counties and distribution systems in the four towns. Total estimated cost of the project is $728,854, including $175,047 for the distribution systems.

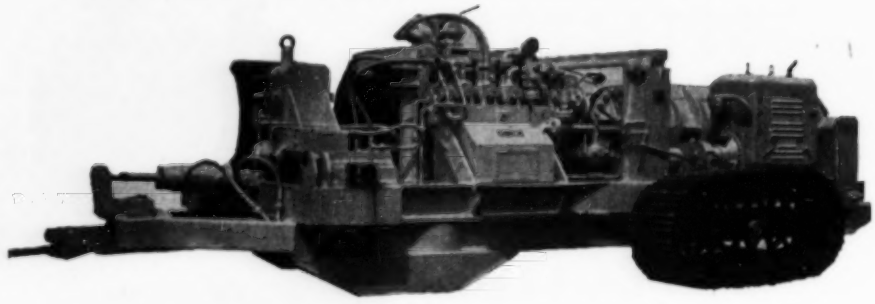
In Wyoming, Montana-Dakota (Docket G-2382) proposes to build about four miles of line in Big Horn and a metering station in Carbon county, Mont. The application also requests authorization for Montana-Dakota to lease and operate a 2640-hp compressor station in Big Horn county, Mont., to be constructed by Montana-Wyoming Gas Pipe Line Co. Total estimated cost of the facilities is $789,676.

Underground storage pools planned by United Fuel

Plans for establishing two new underground storage pools with an estimated total capacity of 28 billion cu ft of natural gas were announced last month by United Fuel Gas Co., Charleston, W. Va.

The larger of the two pools, accounting for about 20 billion cu ft, will underlie 16,500 acres in Jackson county. The smaller pool will be located chiefly in Wood county but will extend into parts of Wirt and Jackson.

The project, which will include two new compressor stations and transmission lines



CINCH Pipe Bending Machines were new to the industry in 1948

Pioneering the FIRST big inch SMOOTH BENDS—Permitting cleaning and priming, doping and wrapping all in one continuous operation—FOR A SPEEDIER PIPELAYING OPERATION

This is 1954 and the leading pipeline contractors are using **CINCH PIPE BENDING MACHINES** because **CINCH** has, through continuous structural and hydraulic improvements, increased the speed, ease of operation and efficiency of their machines, assuring the contractors speedy, economical, safe pipe bending—pipe that is bent smooth—bends that fit the ditch—right on the job. So far, no better way has been found to control cold compression pipe bending than through hydraulic power.

FOR GREATER SPEED — Automatic hydraulic wedge-type pin-up slide, larger piston rams with larger return oil lines, hydraulic lift tongue and hydraulic powered Tulsa winch for moving pipe through bending dies.

FOR EASIER HANDLING — All controls in reach of operator, Athey tracks are optional.

THE "CINCH PIPE BENDER" MAKES PIPE BENDING A CINCH

CINCH
PIPELINE EQUIPMENT, Inc.

Our business is manufacturing pipe bending machines. Call us if you have pipe bending problems. Write for information on our three sizes of machines — 6" through 20", 16" through 30" or 32" through 36".

7020 LONG DRIVE
MILBY 2484
HOUSTON 17, TEXAS

is expected to cost more than $14 million. One new station will be built north of Ripley and another near Rockport in Wood county.

FPC disposed of 26 rate cases in 9-month period

A total of 26 natural gas rate cases involving $115,648,600 in proposed wholesale increases were disposed of by the FPC during the nine-month period ended March 31. This is more than the combined total —both dollarwise and in number of cases— of the two preceding fiscal years, Chairman Jerome K. Kuykendall reported.

Still pending at the end of March were 38 rate cases involving about $103,608,000 in increases. Nine months earlier there were 19 cases pending, involving $162,730,000. Another $56,526,000, representing 25 cases, had been suspended by the FPC up through March, making a total of $219,256,000 before the commission during the nine-month period.

Out of the total $115,648,600 in proposed increases disposed of during the first nine months of the current fiscal year, the FPC disallowed $31,490,500 (27.2%). Of the remaining amount, $81,990,100 was allowed and $2,168,000 was withdrawn as a result of settlements in related cases.

Northwest case nears end; oral argument on June 1

The end may be in sight of the long, drawn out case involving gas service to the Pacific Northwest with the FPC eliminating the intermediate decision procedure and scheduling an oral argument to be held June 1.

The omission of the intermediate decision was requested by Pacific Northwest Pipeline Corp., Houston, and Westcoast Transmission Co. Inc., Wilmington, Del., two of the competing applicants in the case. The action means that the case will be decided directly by the commission without the filing of an intermediate decision by a hearing examiner.

Clearing up an incorrect impression

It appears that we may have left an incorrect impression by the text of our item entitled "'Duratex' Name Belongs to National Pipe Coatings" appearing on page 158 of the March issue of *GAS*.

In the case to which we referred, the court entered a judgment based upon a settlement agreement between the parties.

William S. Stokes, president of Plico Inc., was one of the founders of National Pipe Coatings and a party to the settlement agreement.

Mr. Stokes manufactured and sold pipeline coating materials prior to formation of

Here's How to Put Your Trenching and Lifting on a More Profitable Basis!

Mobile Bantam - Truck or Crawler Mounted Replaces Many One-Purpose Machines - Saves Money!

It will pay you to investigate the versatile Bantam Method of trenching that will cut costs. Why go to the expense of moving in big equipment, or special work crews, when hundreds of jobs like those listed at the right can now be handled faster, more economically with a job-proved Bantam. A Bantam will dig 100' of 5' trench per hour.

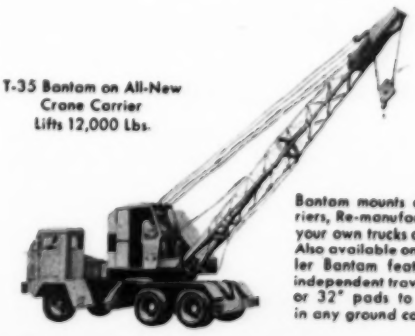
Costing only a fraction of the price of bigger machines, mounted on Crane Carriers, Re-manufactured Trucks and Crane Carriers, or Crawlers, Bantams' 9 quick-change front end attachments have big work capacity - for profitable year-round operation. A Bantam is ideal for scattered assignments or crowded locations where bigger, heavier machines can't go.

Write for complete specifications, information and prices. Arrange a free on-your-job demonstration. Write today!

MORE JOBS BANTAMS CAN HANDLE!

- Loading sand and gravel
- Laying mains
- Installing and maintaining compressors
- Unloading pipe and materials
- Aligning pipe and fittings
- Excavating for leak repairs
- Uncovering lines for inspection
- Backfilling trenches
- Lifts up to 12,000 lbs. (truck mounted)

T-35 Bantam on All-New Crane Carrier Lifts 12,000 Lbs.



Bantam mounts on Crane Carriers, Re-manufactured trucks or your own trucks of suitable size. Also available on trecks - Crawler Bantam features 2-speed independent travel, has 16", 24" or 32" pads to go anywhere in any ground condition.

C-35 Bantam Crawler 3/8 Cu. Yd.

SB-G-2

WORLD'S LARGEST PRODUCER OF TRUCK-CRANES AND EXCAVATORS

SCHIELD Bantam®

COMPANY • 268 PARK ST., WAVERLY, IOWA, U.S.A.

MEMO

Pipeliners
DEPEND ON
MAVOR-KELLY CO.
PRODUCTS • SERVICE

BITUMASTIC
HOT & COLD APPLIED COATINGS

TAPECOAT
PIPE JOINT PROTECTION

Carey
PIPELINE FELT & PADDING

PROTECT against costly corrosion with our nationally-known products that are thoroughly proved, immediately available and backed by our trustworthy service.

M & M BLDG.
HOUSTON, TEX.
PHO. CA-2203

MAVOR-KELLY COMPANY

FOR SALE
(Immediate Delivery)
8" & 12" LINE PIPE

150,000 - 8⅝" O.D. .322 wall
28.55# Lapweld

125,000 - 12¾" O.D. .375 wall
49.56# Lapweld

#1 Grade, all machine cleaned, commercially straight, 20' single random lengths, ends beveled. Used first class condition. Suitable installation oil, water or gas pipeline systems, 850# to 900# P.S.I. Price attractively for prompt shipment, Welda, Kansas, and Grandview, Missouri.

•

WIRE - WRITE - PHONE

Humboldt - Chicago
Pipeline Project
216 W. 2nd St. Tulsa, Okla.
Ph. 3-5400

Cleaner Pipelines Co.
1900 Armour Road
North Kansas City, Missouri

★

Internal Pipeline Cleaners
EXPANSIBLE RUBBER CORE
For Gas Transmission Lines
6" through 30"

Spring Loaded Cleaners
Individual Coil Springs Under Each Brush
For Oil, Gas and Products Lines
10" through 30"

Night Caps — Squeegees
Pipeline Tools and Other Accessories

WRITE FOR CATALOG

National Pipe Coatings, and continues to manufacture and sell a top-grade line of pipeline coatings under the trade name "Plico." Offices of Plico Inc. are located at 1566 E. Slauson Ave., Los Angeles 11, Calif.

Tank barges to carry gas from Gulf to Chicago area

Natural gas in a liquid form will soon be carried in heavily insulated tank barges from Gulf coast fields up the Mississippi and Illinois rivers to northern markets, it is reported. Eight such barges are being built at Pascagoula, Miss., for W. L. Morrison and associates of Lake Forest, Ill.

Small amounts of gas that evaporate from the barges will be used as fuel by the tow boats. Once the gas reaches its northern markets, it will be vaporized by warm brine and used for power. The brine, in turn, is expected to more than pay for the liquefaction of the gas at its source by supplying refrigeration. The refrigeration will bring an estimated 5 cents per MMcf of gas.

Plans are for the barges to make 11- to 14-day round trips between Louisiana gas fields and the Chicago area. They will be able to provide 18 MMcf of gas daily.

Cancellation of contract sought by royalty owners

Two royalty owners, who describe themselves as part of approximately 2500 owners with similar interests, have filed an amended and supplemental suit in federal district court in Shreveport seeking cancellation of United Gas Pipeline Co.'s purchase contract in the Cotton Valley, La., field. They ask back payment from the company, which may total $1 million or more, according to estimates in the petition.

The suit alleges violation of the Sherman antitrust act, Clayton and Robinson-Patman acts, in that United Gas is a member of the United Gas system and that the system is an amalgamation of more than 50 persons originally organized as competitive enterprises but which now dominate production and marketing of gas in north Louisiana.

Specifically attacked is the Cotton Valley unitization and pressure maintenance agreement signed April 29, 1940 and later extended as limits of the field were extended. Under the agreement, United Gas purchased all gas in the Cotton Valley field.

Columbia subsidiaries to build $40 million projects

Certificates have been issued by the FPC to six Columbia Gas System subsidiaries for the construction of new pipeline facilities having a total estimated cost of more than $40 million (Docket G-1850, etc.).

Atlantic Seaboard Corp.: $14,610,300 for 116 miles of line and 4400 hp in compression. United Fuel Gas Co. and Central Kentucky Natural Gas Co.: about $12 million for 59 miles of line and 6000- and 4400-hp

compressor stations. Manufacturers Light & Heat: $3,747,446 to activate underground storage facilities and $5,968,300 for 75 miles of line and 4400 hp in compression. Ohio Fuel Gas Co.: $2,668,000 for 63 miles of line. Home Gas, $2,160,500 for 50 miles of line in New York.

Pipeline Notes

Stanolind Oil and Gas Co., Tulsa, will exercise its option to buy the stock of Carthage Hydrocol Inc., owner of a synthetic natural gas plant in Brownville, Texas, that has been idle since July 1953. Stanolind has guaranteed to repay a $17.6 million debt owed by Carthage to the Reconstruction Finance Corp.

El Paso (Texas) Gas Co.'s president, Paul Kayser, last month told the Colorado PUC that his company has an option to buy two-thirds of common stock of the Colorado Western Pipeline Co., which is seeking to build a $21 million gas line from southwestern Colorado to Denver. In his testimony at the hearing on the case, Mr. Kayser said his company has agreed to supply Colorado Western up to 50 MMcf of gas daily from its own sources in the San Juan basin in case Colorado Western fails to obtain 100 MMcf from other sources.

Cities Service Gas Co., Oklahoma City, has asked the FPC (Docket G-2383) for authority to build 33 miles of 26- and 16-in. line in Kansas and Missouri to replace existing lines.

Louisiana's Supreme Court has ruled that state severance taxes must be paid by companies removing oil and gas from Barksdale air force base near Shreveport. Justice Moise, in the court's majority opinion, said that "in the operation of the oil field, the lessees were not militarily engaged. The . . . oil and gas . . . did not belong to the federal government, but to private owners. No severance tax is levied against the government nor is there any tax levied on the lands or the instrumentalities of the federal government."

Black, Sivalls & Bryson Inc., Kansas City, has appointed two representatives for its line of automatic control equipment and safety heads. Fluid Controls Co., Philadelphia, will cover the District of Columbia, Maryland, and part of Virginia. Berry Ervin Engineering Co., Minneapolis, will cover Minnesota, North Dakota, and parts of South Dakota and Wisconsin.

Allan Edwards Inc., Tulsa, has been named manufacturer's representative of the Warner Lewis Co. division of Fram in the Mid-continent area, to handle the complete line of separators, meter calibrating tanks, industrial filters, and non-ferrous and alloy fabrications. Allan Edwards has also been named representative in the area for the LaBour pump.

Progress Reports

NEW CONSTRUCTION PLANNED

CITIES SERVICE GAS CO., Oklahoma City. Docket G-2383 for 24-mile, 26-in. replacement line in Franklin and Johnson counties, Kan., and 9-mile, 20-in. replacement line in Cherokee and Jasper counties, Mo.

MONTANA-DAKOTA UTILITIES CO., Minneapolis. Docket G-2397 for 56-mile line in Hettinger and Stark counties, N. D., to supply Regent, Mott, New England, and Lefor, N. D.

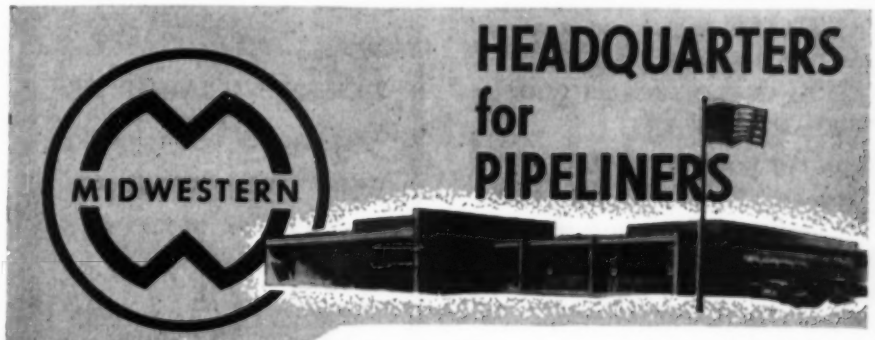
MONTANA-DAKOTA UTILITIES CO., Minneapolis. Docket G-2382 for 4 miles of line in Big Horn county, Wyo., metering station in Carbon county, Mont., and 2640-hp compressor station in Big Horn county, Mont.

NORTHERN NATURAL GAS CO., Omaha. A 167-mile line to serve Duluth, Minn., and Superior, Wis.

CURRENT CONSTRUCTION

EL PASO NATURAL GAS CO. Docket G-2106. Work continuing on gathering lines, purification facilities and compressor plants totaling 161,860 hp to carry gas from Permian and San Juan basins. Contractors are Oklahoma Construction Co., R. H. Fulton Co., Western Pipeline Constructors Inc. and company's own crews. All facilities to be in operation by November 1954.

EQUITABLE GAS CO., Pittsburgh. Docket G-2130 to activate the Logansport storage field in the



CORROGLAS — A thin, flexible, inorganic glass wrap longitudinally reinforced for maximum wrapping strength. Corrosion protection in rolls from 400 to 1600 feet.

OUTER WRAP — An all-glass outer wrap with less than 1% water absorption rate. High porosity reduces holidays. Perfect for use in double-coat-double-wrap operations.

KAPCO ROCK SHIELD — A mastic composition board for protecting pipe and coating in rocky areas. Drastically reduces dirt padding. Offered in various thicknesses.

ASBESTOS FELT — Answers every need where felt application is being used. A quality material backed by years of experience in the felt manufacturing business.

GLASFAB — A flexible, non-irritating glass fabric handwrap. Compatible with both hot and cold bitumens. Excellent for repair work on pipe and for coating tank bottoms.

MAGNESIUM ANODES — For positive corrosion protection against soil acids, stray underground currents. Anodes neutralize electrochemical corrosion.

PROTECTO WRAP — A plasticized coal-tar enamel impregnated into and around a woven glass fabric base. Application is fast and easy by merely "flashing" with a torch.

AND MANY OTHERS — Concrete River Weights • Tipton Line Up Clamps • Pipe Hooks • Pipe Dollies • H & M Pipe Beveling Machines • Pipe Slings • Steel Binder Tools • A & M Pipe Caps • Kraft Paper • Asbestos Felt • Plico Casing Spacers and Seals

4645 Sapulpa Rd.
Tulsa 5-0144
15 SW 29th St.
Oklahoma City
CE-22527

MIDWESTERN ENGINE & EQUIPMENT CO., INC.

HOUSTON, TEX.
Clem F. Straughan, Midwestern, Inc.
5016 Greggs Road—Mission 9-2721

NEW YORK, N.Y.
J. B. Adoue, Jr., International Oil Equip. Co., Inc.
30 Rockefeller Plaza—Columbus 5-6250

PITTSBURGH, PA.
John R. Wilson, Park Bldg. Rm. 1025
5th Ave. and Smithfield St.—Express 1-3952

SHREVEPORT, LA.
Tom L. Holcombe
Box 1306—Phone 5-3468

ATLANTA, GA.
Ramond F. Trapp, 5005 Peachtree Road
Chamblee, Ga.—Chamblee 7-9686

CHICAGO, ILL.
F. J. Steinmiller, 220 S. Owen St.
Mt. Prospect, Ill.—Clearbrook 3-4439

ROSKOTE

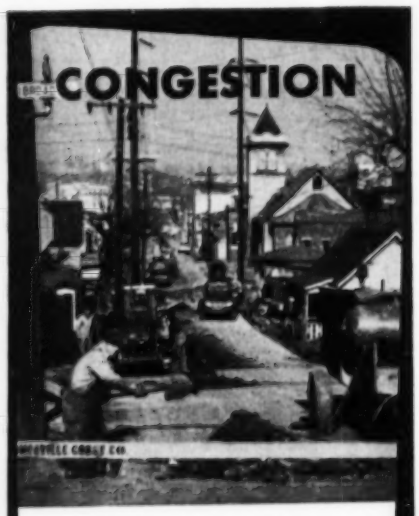
the Cold-Applied "UTILITY" MASTIC

has the approval of the most critical and exacting companies. Join the 100 or more that are specifying ROSKOTE again and again for continuous protection against corrosion at a minimum cost.

Send for your folder and discover why ROSKOTE can be used with confidence either above or below ground.

Write today!

ROYSTON LABORATORIES, INC.
P.O. BOX 112-G, BLAWNOX, PA.



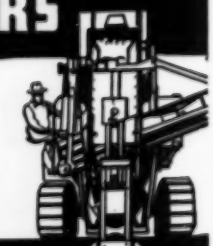
DOESN'T HAMPER US

We specialize in laying gas mains and services in congested areas.

SIGN OF SATISFACTION
TRANSMISSION LINES
DISTRIBUTION SYSTEMS

SOMERVILLE CONSTRUCTION COMPANY
ADA, MICHIGAN

Barber-Greene... Vertical Boom DITCHERS



dig clean

leave no ramp

discharge on either side

cut trenches to 8'3" deep 24" wide

See your B-G distributor or write:

Barber-Greene
AURORA, ILLINOIS, U.S.A.

The Sign of Integrity

O. R. BURDEN Construction Corporation
TULSA, OKLAHOMA

O. R. Burden, President
P. T. Thibodaux, Vice-President
J. S. Burden, Vice-President

GENERAL PIPELINE CONSTRUCTION
P. O. Box 5216 • Phone 8-3378

Big Injun Sand, Marion county, W. Va. Installation of a 1320-hp compressor station in Wetzel county remains to be completed in the spring.

GULF INTERSTATE GAS CO., Houston. Docket G-2058 to construct 860 miles of 30-in. line from Rayne, La. to Boyd county, Ky., 229 miles lateral lines and five 8000-hp compressor stations in four states. Mainline contracts let to H. C. Price and Houston Contracting Co. Lateral line contracts let to Anderson Bros., Associated Pipe Line Contractors and Williams Bros. Parkhill Truck Co. hauling pipe. Expect completion Nov. 1, 1954. Over 700 miles of 30-in. line completed. Work under way on 313 miles of gathering lines.

MISSOURI PUBLIC SERVICE CO., Warrensburg. Mid-States Construction Co. was scheduled to begin work May 15 on 25 miles of 10-line line from Warrensburg to Clinton.

PACIFIC GAS & ELECTRIC CO., San Francisco. Docket No. 2212 for 11 miles of 24-in. line to serve steam electric plant near Pittsburg. Scheduled for completion 1954. Company forces constructing.

PACIFIC GAS & ELECTRIC CO., San Francisco. Docket G-2101 to build about 200 miles of 34-in. mainline loops and 2500 hp in compressor capacity on line from Topock, Ariz. to a point near Milpitas, Calif.; and 7.2 miles of 30- and 34-in. and 1.9 miles of 22- and 24-in. line between Milpitas and Irvington, Calif. Pipeline work under contract to Engineers Ltd. Pipeline Co. Compressor under contract to Bechtel Corp. Entire job expected to be completed in 1954.

SOUTHERN NATURAL GAS CO., Birmingham. Docket G-1907. About 250 miles various size line and 4400 hp compression remaining for construction in 1954 and 1955. Construction expected to begin March 15.

APPROVED

ATLANTIC SEABOARD CORP., Charleston, W. Va. Docket G-2286 for 116.6 miles of 26-in. line in five sections paralleling portions of existing system and addition of total of 4400 hp at two existing and one new compressor station.

COLORADO INTERSTATE GAS CO., Colorado Springs. Docket G-2269 for 49.5 miles of 20-in. line from Morton county, Kan. to Hooker, Okla.; dehydration plant and expansion of gathering system in Morton county and delivery meter station in Hooker.

HOME GAS CO., Pittsburgh. Docket G-2287 for 50 miles of 12-in. line in Broome, Tioga and Delaware counties, N. Y.—24.3 miles from Maine to Tioga and 25.4 miles from Deposit to Port Dickinson.

IROQUOIS GAS CORP., Buffalo, N. Y. Docket G-2369 for 24½-mile, 20-in. line in Erie county, N. Y., to extend from compressor station in Elma to city gate station in Tonawanda, N. Y.

MANUFACTURERS LIGHT & HEAT CO., Pittsburgh. Docket G-2193 for 72 miles of 20- and 16-in. line, 38.7 miles of storage and well lines, 2 measuring stations and a 1760-hp compressor station at the Victory storage field in Marshall and Wetzel counties, W. Va.

MANUFACTURERS LIGHT & HEAT CO., Pittsburgh. Docket G-2289 for construction of 75½ miles of 10-, 12-, 24-, and 26-in. lines and 4400 in new and additional compressor facilities in Washington, Allegheny, Chester, Lancaster, and Adams counties, Pa., and Marshall county, W. Va.

NATURAL GAS PIPELINE CO. OF AMERICA, Chicago. Docket G-2282 for 1250-hp compressor unit at Hooker, Okla. station and 2750 ft of 24-in. line connecting station.

OHIO FUEL GAS CO., Columbus. Docket G-2288 to construct 63 miles of 16- and 20-in. loop and replacement lines to insure service to existing markets.

UNITED FUEL GAS CO. and CENTRAL KENTUCKY NATURAL GAS CO., Charleston, W. Va. Docket G-2285 for construction of a 4400-hp compressor station at its storage pool X-59 in Jackson county, W. Va. Also 59 miles of line and 6000-hp compressor station.